

Industrialization and landscape: gum resin pinewoods of France, Spain and United States in the 19th and 20th centuries

Abstract

Gum resin as natural resource has a long history. In regard to landscape transformation has been quite decisive in numerous pinewoods, however, it is barely known outside places of production and consumption. In the last two centuries the demand of its main by-products, spirit of turpentine and rosin, grew exponentially while chemical industries such as paint and varnish, paper, rubber, soap, etcetera, were increasing its production. Considering that was necessary to keep the forest standing in order to get the gum resin I am going to compare the situation of pinewoods in France, Spain and United States, to show the consequences in the landscape of this industrial activity in different contexts and backgrounds. The most important cause in pinewoods transformation into «organic machines» was forestry, and politics; nevertheless, its application depended upon regional and national trajectories. The case of gum resin pinewoods is a good example of how industrialization had to deal with nature to obtain organic chemical products, studying intensely the mechanisms of the forest and the pine with the economical and ecological idea that preserve them was the aim, and so, transforming them into a crop of pines with its socio-environmental consequences.

Resumen

La resina de goma como recurso natural tiene una larga historia. En cuanto a la transformación del paisaje ha sido bastante decisiva en numerosos pinares, sin embargo, apenas se conoce fuera de los lugares de producción y consumo. En los dos últimos siglos la demanda de sus subproductos principales, el espíritu de la trementina y la colofonia, creció exponencialmente, mientras que las industrias químicas como la pintura y el barniz, el papel, el caucho, el jabón, etcétera, aumentaban su producción. Teniendo en cuenta que era necesario mantener el bosque en pie para obtener la resina de goma voy a comparar la situación de los pinos en Francia, España y Estados Unidos, para mostrar las consecuencias en el paisaje de esta actividad industrial en diferentes contextos y procedencias. La causa más importante en la transformación de los pinos en «máquinas orgánicas» fue la silvicultura y la política; Sin embargo, su aplicación dependía de trayectorias regionales y nacionales. El caso de los pinares de resina de goma es un buen ejemplo de cómo la industrialización tuvo que lidiar con la naturaleza para obtener productos químicos orgánicos, estudiando intensamente los mecanismos del bosque y el pino con la idea económica y ecológica que preservarlos era el objetivo, Transformándolos en una cosecha de pinos con sus consecuencias socioambientales.

Introduction

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The aim of this paper is to expose the outcome and the process in which were involved the pine woods of United States, France and Spain where took place the exploitation of gum resin in nineteenth and twentieth centuries. It was a landscape change process that has ended up in a particular conception of gum resin and its current potential. For instance, in European countries it is seen not only as a natural resource able to provide useful substances for the chemical industry but is recognized as a tool to preserve the forest and the rural life; whereas in United States it is only seen as a commodity ialization and landscape: gum resin pinewoods of France, Spain and United States in the 19th and 20th c

The main difference of this situation was the technique applied in both spheres: harvesting of gum resin and forest management. The result in the European case was the conservation of the forest while in the other was its almost entire devastation. However, no matter whether in European countries or United States, gum resin has been quite decisive in landscape change as a cause and as a consequence. And not always the preservation as it happened has been welcomed by present observers.

The history of gum resin is barely known outside places of production and consumption. It is a natural resource with an almost nonexistent attention neither forest nor commodity historiography; nevertheless, it has a rich and complex participation in modeling both the woodlands and the chemical field. At the moment, in some academic and political areas gum resin is part of the known as non-timber forest products¹, which are gaining relevance in the study of woods beyond its most important and recognized resource, so, its study will help us to enlarge our understanding of the history of piney regions.

In United States that region was, by far, the largest of these three countries. It was situated from eastern North Carolina until eastern Texas through all the states in between (South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana), with

¹ FAO's definition of non-timber forest products encompasses five broad product categories: foods; floral greenery and horticultural stocks; medicinal plants and fungi; lichens, fiber and dye plants; and oils, resins, and other chemical extracts from plants, lichens and fungi (Lewis, 2003).

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an extension of approximately 35 million hectares. In France the most known region for gum resin production was located in southwest, in Landes of Gascony, where the pinewoods cover almost 1 million hectares. Finally in Spain, production zone was not located in one area; the most important of these was in the Castilian plateau (central Spain), a zone called Land of Pinewoods, in the northwest province of Segovia, and a small portion in southeast Valladolid, with more less 200.000 hectares.

The relevant issue on this comparison is not the extension but the social, economic, political and environmental background in each piney region where gum resin production was developed. The involvement of central governments was crucial to the specific growth of each gum resin producer region. Hence, the comparison seeks to put together all these experiences in order to assess every history in a broader context and to see how was linked this commodity and the environments. In the end, is about how culture and nature are related in diverse spaces during industrial revolutions.

A new economic activity: forests, pines and gum resin

These three countries and regions have a very particular history that endows of some peculiarities in each case; however, they have in common that the origin of their gum resin production was based on the increasing demand of its derivatives (spirit of turpentine and rosin) by chemical industry, in steady growing since late eighteenth century. Nevertheless, the manufacture of resinous products was pretty old, but despite that those by-products were well-known substances in the eighteenth century they were not the principal ones. Naval stores industry, as called in Anglo-Saxon countries, was focused in producing tar and pitch from dead resinous wood, principally to naval manufacturing, above all to ships' waterproofing and ropes' coating. Until that moment Scandinavian countries were the major producers of these commodities. Stockholm tar (mainly manufactured in Finland) was the most known tar in the international market and Great Britain was its principal consumer.

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At the turn of the century, when wood shipbuilding started its decline, tar and pitch were less and less used for this purpose, while spirit of turpentine and rosin began its increasing demand by industries such as paint, varnishes, paper, soap, rubber, lighting, etc. Unlike tar and pitch, spirit of turpentine and rosin were manufactured (and still are) from gum resin obtained from the living tree; hence, each producer had to create a method to get the natural resource from the pine and the forest, a method normally embedded in local and/or regional practices. However, no matter what kind of technique was employed to get the resin, the relevant thing was that resinous industry was shifting from one sort of processes and products to another one².

The new productive model for naval stores industry was based on political, trading, industrial, technological, and environmental issues. The regions that wish to be part of it required the adequate weather, pine specie³, and experience working with resinous products. Politics were pretty relevant to promote the industry, therefore, in early nineteenth century only United States, neither France nor Spain, was part of international market because a century before Great Britain had been fostering naval stores manufacture in their American colonies in order to supply their shipbuilding industry. In this regard, when all those issues came to converge landscape transformation began; first in United States, then in France and later in Spain, in early eighteenth century, at the turn from eighteenth to nineteenth century and during the second half of the nineteenth, respectively.

For much of the period considered in this paper, in the resinous international trade Great Britain led the demand while United States the supply. American Civil War (1861-1865) allowed the entry of other gum resin manufacturers on the world concert, especially France, but encouraged the consolidation of European gum resin industries

² Indeed, this industry maintains its name in Anglo-Saxon countries despite it has nothing to do with naval manufacture.

³ Resin oozing from the trunk was only possible in areas where weather permitted it. This was not the case in Scandinavian countries. On the other hand: “while most pines are capable of yielding resin on tapping, it is only economic to do so if the quantity obtained is sufficient and its quality is acceptable” (Coppin / Hone, 1995).

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also, like Spanish, influenced by French technical track⁴. Thus, to being part of this market was needed, on one hand, to have enough forest resources or, on the other, to manage properly the available ones. United States was the example of the former, France and Spain of the latter. From this circumstance the differences between American and European cases started to arise. Let's begin our journey in the New World.

United States

The dominant tree specie was longleaf pine (*Pinus palustris*), however, the mixture of hardwoods represents the natural climax forest for the southeastern United States' coastal plain (a vast space from eastern Virginia to eastern Texas), but in areas that experience frequent fires, caused either by lightning or humans, the longleaf remains dominant (southeastern forests endured frequent fires mostly by human action; for Native Americans fire became central to the maintenance of a human-centered ecology). Although longleaf pine produces seed only at long intervals, usually no more than once every seven years, it does so in abundance; besides, its slow growth gives it superb fire resistance and in the case of a conflagration, if it survives, develops a layer of heavy bark that can protect it from most fires for the rest of its life. Moreover, sustained dry periods, high winds, and especially sandy soil, relatively infertile, is the perfect environment for the longleaf pine because it possesses a long taproot that enables it to access nutrients and water, and serves to anchor it against windy conditions. Accordingly, these ecological features gave the longleaf a natural advantage over other competing tree species and the southeastern forests a comparative advantage in naval stores production (Outland 2004, 15-19; Driscoll / Kick, 2012, 11-12).

In late seventeenth century, depletion of English woodlands fostered the procurement of naval stores to the British navies, so, their production in American

⁴ Market integration was a gradual process, a big change that took place between 1800 and 1950: "a slow evolutionary change with revolutionary consequences" (McNeill, 1992, 8).

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Colonies was encouraged through bounties. The Naval Stores Act (1705) was the most significant action of this intention. It was enacted also by the combination of the break in Baltic naval stores trade and the Whig party's mercantilist designs. This law remained until 1775, when revolution of independence began. Since early eighteenth century, almost all tar manufacture was located in eastern North Carolina –in fact, it became known as the “Tar Heel State”–. After the war, this state continued to dominate North American production even without the bounty. In this area production was primarily carried out by small-scale farmers and backwoodsman, many of whom work unassisted, who used income from naval stores to supplement their own subsistence agriculture. The increased demand of spirit of turpentine for lighting (to produce camphene) and rubber industry (to use it as solvent) in early nineteenth century contributed even more to the industrial expansion of the sector in North Carolina, expansion benefited from the improvement and construction of transport infrastructure, either inland or on the coasts, in the 1830's. Another factor favoring the spread of naval stores in United States was the repeal in May 1845 of the British tax on turpentine products⁵, causing an increase in imports from United States, rising prices, and speculation⁶.

The changing nature of turpentine production from a small-scale business dominated by casual producers who also dabbled in agriculture to one controlled by large and highly specialized operators likely accelerated forest devastation (...). When a turpentine operation was a small part of a larger farming enterprise, producers probably used more care to extend the life and efficiency of the forest (...). Turpentiners who operated on a grand scale and focused almost exclusively on gum and spirit production had less incentive to prolong their use of the pines and ran more exploitative operations. The increasing number of such producers in the 1840's and 1850's meant more widespread forest degradation (Outland, 2004, 106).

⁵ Turpentine is the intermediate product between gum resin and spirit of turpentine and rosin.

⁶ Percival, 1968, 512-513, 517; Johnson, 2000, 996; Outland, 2004, 9, 37, 49; Driscoll / Kick, 2012, 10, 13-14.

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Forest devastation was due to the method used to harvest the gum resin, which consisted in opening at the base of the trunk a cavity for collecting the raw material secreted from the incisions that were performed immediately above this hollow and until a height of over three meters. These incisions shaped a face; as a rule, trees endured only two faces, i.e. two cavities, although there were cases in which trees bore three or four cavities. Box-system was the name of this technique. The great drawback was that every pine could be worked at most for ten years, and then died; boxes injured and weakened trees, leaving them susceptible to wind, disease, drought, infestation, and fires, especially in abandoned turpentine orchards. When gone, the longleaf pine failed to reproduce itself, and a different vegetation replaced it with an almost unmixed growth of thickly set dwarfish scrub oaks (Outland, 2004, 98-101, 106; Driscoll / Kick, 2012, 15).

Since early 1800's, woodlands were abundant and relatively cheap, for this reason buying forest tracts was easy for people who had decided to get into the turpentine industry. Moreover, property rights to much of this kind of lands in the South were well established by the mid-century. Thus, North Carolina producers who wished to remain in the business began buying virgin pine forests in states to the south and moving their labor force, i.e. their slaves. In fact, North Carolinians were responsible for much of the industry's antebellum growth in other southern states. In their own state, however, when it was more obvious that turpentine was devastating their forests in 1850's and 1860's (even in areas where the boom had begun in the 1830's), this activity was seen as a curse, so it was emphasized the need to raise cotton instead –introduction of lime, manure, superphosphate, and guano fertilizers during these years made the shift to cotton cultivation feasible– (Percival, 1968: 524; Johnson, 2000, 998-999; Outland, 2004, 108).

One observer of the naval stores industry, quoted by Outland (2004, 111), has argued that “turpentine represented the extensive and exhausting practices that had long characterized use of southern land. Like tobacco in Virginia in the seventeenth century and indigo in South Carolina during the eighteenth century, turpentine stood for the maximum exploitation of land and labor in the short run”.

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Since 1840's turpentine production began to move southward. First to South Carolina, where it was possible to buy land for 50 to 70 cents per acre (0.4047 ha). Then came Georgia, where there was hundreds of thousands of the finest longleaf pine acreage (some cost \$2 per acre). In Florida forests tracts where in between \$1 and \$1.25, however in this state, grand-scale production started a little bit later, after Alabama but earlier than Mississippi, Louisiana and Texas. Civil War (1861-1865) brought the disruption in trade, the loss of stills, and especially the emancipation of the slaves. It had effectively brought the southern naval stores industry to a halt; nevertheless, United States' rapid industrialization during and after the war expanded the demand for naval stores, thus, by 1870 the industry was in a good shape again. Land prices increased and the practice of leasing became common, actually, in the first decades of 1900's was easier for producers to lease than purchase (Outland, 2004, 111-127, 145).

Voices for and against naval stores production began to arise. The argument of the advocates was that, despite forests depletion, naval stores had brought civilization to the communities that live in these areas (indeed, some southerners believed that ample resources remained and complete depletion lay only in the distant future). While one of the opponents calculated that every three years approximately one and half million hectares in Georgia alone were consumed for turpentine (Outland, 2004, 210).

In this context was when finally appeared the federal Bureau of Forestry. Definitely it was a turning point in naval stores history, exactly when three late-nineteenth-century developments pushed the region toward support of conservation: depletion of resources, growth of organization, and the development of science. The success of the university-trained researchers (in getting a higher-grade resin and causing less harm to the tree) fostered a more receptive environment for scientific forestry among many producers. But one thing was to accept their suggestions and other was to buy new equipment to harvest the resin. This was Herty's method, developed between 1901 and 1904 and inspired in French Hugues' system; it was also known as cup and gutter system, which eliminated the box, augmented the quantity and the quality of crude resin, and facilitated the work. Lack of capital and conservative producers who preferred traditional methods made innovation unlikely. In spite of this reality, at the

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federal level, to encourage enhanced practices was demanded strict adherence to improved methods when public pineland was leased for turpentine. Furthermore, during 1920's, three experiment stations began to operate in the South. So, was in this new conservation wave that foresters pushed to plant denuded forests tracts through reseeded –some states and counties that owned some of this lands tried to sell it as potential farmland–. Instead of longleaf pine the selected specie was slash pine (*Pinus elliotii*), which grew faster and, best of all, yield more resin than the longleaf. These stands were known as second-growth forests, and by 1930's there was almost 15 million hectares. This came to bring an end to the characteristic mobility of naval stores industry. In addition, alongside other circumstances, it provoked a sense of resurrection among producers, even over-production (Merriam, 1939b, 322; Outland, 2004, 211-257).

On the other hand, the devastating American method to tapping the pines of the nineteenth century, usually recognized as a butchery, had left behind huge amounts of felled pine trees. This circumstance was exploited to use these pine stumps rich in resinous materials which provide turpentine and rosin by dry distillation. The new industry was called *wood naval stores*, forcing to rename as *gum naval stores* the traditional industry, further implying a serious competitor⁷. At the end, this novel production helped to the demise in late 1940's and early 1950's of the economic activity based on the harvesting of gum resin from living trees in the United States.

France

The comparison between American and French gum resin industries began in late nineteenth century when competition within international market was openly manifest (by then France was the second largest producer in the world, although still farther from

⁷ “By 1945, wood naval stores production exceeded that of gum and, ten years later, outpaced it by two and a half times, only to be replaced itself during the 1960's by the manufacture of naval stores at pulpwood plants” (Outland, 2004, 313).

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United States). To some American producers and observers gum resin industry of Landes of Gascony was the symbol of forest's rationalization; therefore, it was looked with envy. In fact, historians like Robert Outland –author of the probably most important book devoted to the history of American gum resin industry–, maintained in some way or another this opinion.

Where France had created a highly successful naval stores industry from a once-barren sand region, the American South had accomplished the opposite, transforming a healthy pine forest into a near-worth-less wasteland. Moreover, the southern United States possessed more environmental advantages –better soil, longer growing season, and more plentiful rain– than the Landes region, but was still outpaced (Outland, 2004, 157).

In Colbert's motherland, nevertheless, there are now some critical opinions on the outcome that forestry left in their forests.

Jean-Baptiste Colbert, the most important minister under the kingdom of Louis XIV, created the Corp of Waters and Forests in 1669, which was intended to impose administrative supervision on public forests. Hence, State's control over woodlands became a reality, above all to nurture both military and industrial needs. This was a doctrine later known as Colbertism, in which State intervention tried to promote domestic manufacturing in order to buy within the nation and sell abroad. In resinous products' case, this was clearly materialized in tar production's encouragement. One of the zones chosen to produce tar was Landes of Gascony, where was some kind of expertise in producing resinous products. Though this industry did not work out because several circumstances. Regardless of this failure, State interest in natural resources management was *in crescendo* (unlike Americans, Europeans had scarce raw materials), becoming one of the most characteristic features of modern States.

In southwest France, pine forest has been perpetuated by natural regeneration since ancient times, being subject of burning by local shepherds during many centuries. Hence, Landes history has been characterized by the belief that the region had been

completely devastated, from the myth of complete nudity to the brilliant idea to plant pines in the late eighteenth century. However, some researchers have shown that pines' replanting in the area was a common practice at least since seventeenth century. It was a region characterized by a triple marginality: ecological, economic and social. The engineer Nicolas Brémontier, member of the Corp of Bridges and Roads and keen observer of local practices, was the first government employee who, from 1780 to 1805, devotedly worked in fixing the sandy soils, nay, dunes, in Bordeaux department, by planting pines. As a novelty with respect to other reforestations, this time, next to maritime pine (*Pinus pinaster*) extraordinarily tough and robust herbaceous specie was introduced. European marram grass (*Ammophila arenaria*) is able to withstand drought, acidity and lack of stability of the substrate, which is considered the fixing plant *par excellence* thanks to its dense root system⁸.

In 1793 the dunes' transformation were abandoned due to development of Revolution. In 1801, a government decree formed a mixed commission of engineers of the Corps of Bridges and Roads and Waters and Forests, responsible for continuing this effort. Foresters performed many reforestations, but funds scarcity and the division of attributions between corps did not allow continue the labor with pace required. In 1817 the Royal Ordinance of February 5 definitely gave the administration of the project to the Corp of Bridges and Roads and increased the budget to accomplish it. However, in the opinion of Lorentz, a well-known forester, the work required both corporations: Bridges and Roads to fix the dunes exposed to be lifted by the wind and of Waters and Forests to run forest planting on slopes and small valleys (Lorentz, 1842, 63-64).

It was until the Second Empire (1852-1870) when the other great engineering work –which ended up turning the region in a true object of technique devotion– legitimized Napoleonic power to regenerate rural lands (Lafargue, 2001, 18). It was a fight against the humidity of the Landes through a complex drainage system led by the Hydraulic Service, particularly interested in desiccation and sanitation. This innovation is attributed to Jules Chambrelent, although Sargos insists that in fact the creator of the

⁸ Sargos, 1949, 424-425; Hamon, 1986, 37, 306; Lafargue, 2001, 17; Arnould *et ál.*, 2003, 91.

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filter wells was Henri Crouzet, who had advocated and improved the old method of sanitation in Landes (Sargos, 1949, 187-191).

Meanwhile, the pine continued gaining notoriety at the expense of everything else, especially when turpentine products' demand was in steady increase. To make a sharp distinction Hamon (1986, 306) echoed Manciet's words: the pine was Bonapartist while the sheep was monarchical. Nevertheless, the idea to reforest Landes was conceived before the Revolution. The monarchy tried to maintain and increase wood's availability for use it as heater and fuel, either household or industry (government's support came after Brémontier started to think in stopping the advance of the dunes⁹). These forests, public forests, were guarded by forest rangers, because there was concern to obtain natural resources but also to preserve them. Municipalities kept the ownership but after 1789's Revolution to maintain it was a tough assignment because forests were the most coveted rural properties (Métailié, 1999, 39; Vivier, 2003, 145-148). In this regard, the truth was that during first half of the nineteenth century, the pines and, therefore, resin tappers, were displacing the characteristic shepherds of the region.

The development of pine culture, typical of Landes of Gascony since then, was accompanied by the privatization of property. This phenomenon not necessarily excluded the villagers but instead gave them the opportunity, mainly taken by the local bourgeoisie, to acquire properties. As stated in 1826's book, there was not speculation safest and profitable than pine forests (as cited in Mortemart, 1841, 70). The division of the territory was rather uneven. The vast majority of land near the coast was turned into small and medium properties, while most extensive were those in the interior, where share-cropping was developed. Resin tappers were owners of small properties. There was even a time when, in number, these last were as many as the sharecroppers. Nevertheless, accumulation of wealth did contribute to the decrease of small owners because they could enlarge their property, and as consequence, they started to lease their pines to other resin tappers (Hamon, 1986, 306-310; Lafargue, 2001, 22). Furthermore,

⁹ Lorentz, 1842, 63; Scott, 1965, 119; Arnould *et al.*, 2003, 95-96. According to Scott (1998, 352), one of the indispensable conditions of the formal order, which in this case would be represented by the work of Brémontier, is knowledge and informal practice.

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fragmentation of ownership did not represent any problem to forest maintenance, on the contrary, could be even desirable to avoid complete devastation in case of fire. *«Et le remembrement n'a jamais été dans les Landes une nécessité technique ou industrielle»* (Mortemart, 1841, 99; Hamon, 1986, 310-311). On the other hand, when the use of innovation represented by Hugues pot to collect gum resin began to spread in 1860's, smallholders were the last to invest in that equipment (pot, gutter, nail, and tools to install it¹⁰).

All this process culminated in the enactment of the 1857 Act, which was the most unequivocal symbol of pastoral impersonation for an intensive forestry; unlike 1827's *Code Forestiere*, of national scope, that one was only for Landes. Specifically two points were indicated in the Act as the major problems of the region: one physical, the geologic composition and stagnation of waters, and other social, poor system of administration of common property. On the physical character of the area, it was concluded that the soil was not suitable for farming but for forest, mainly maritime pine, but also oak, cork oak, scotch pine and mountain fir. In short, the State had decided to promote forestry. The work of the Hydraulic Service, headed by Chambrelent or Crouzet, was fundamental in this regard. Concerning common lands, which by mid-century corresponded to 44 per cent of the territory, its owners were obliged to be themselves responsible for cleaning up and reforestation on ordinary tracks of livestock, leaving at least one twelfth of the land for grazing. And finally, when these works were completed, forest tracts should be sold or leased. The state agreed to pay, after sanitation and afforestation, a road network, which later helped to get the products out to the markets of Bordeaux and/or Dax. Soon after, the Regulation of 28 April 1858, to implement the 1857 Act, determined that the Ministries of Finance, Agriculture, Trade and Public Works, in consultation with municipalities concerned, would regulate the time and conditions of livestock, gum resin's harvesting, and the spots where charcoal kilns could be established.

¹⁰ Previous method to harvest the gum was similar to American box-system with a decisive difference: the box was normally made on the ground just below the tree, never on the trunk.

But private forests were by then the most common kind of property, where government had no jurisdiction. Despite all this, the Act was suspended immediately after the conflagrations of 1870. Probably also because from the beginning of the Third Republic the transfer of responsibilities from one ministry to another created a confusion of who was responsible for which tasks. What was learned from the Act of 1857 was: firstly, that was necessary to maintain a pastoral regime to allow colonization and ensure some protection to the forest; and secondly, that was the people itself who created the Landes forest, both smallholders and large producers. Another lesson from this process of institutionalization of the forest was that the exploitation of gum resin helped out to perpetuate existing forests, because it was (and still is) judged as a sustainable and secure raw material (Mortemart, 1841, 64; Sargos, 1949, 155-156, 191, 573; Hamon, 1986, 295, 308).

Since 1860's French gum resin industry started to gain notoriety in the international market of resinous products. Its technical accomplishment and industrial organization were widely recognized. Pine was not only the tree that best outlined the culture of the region, it was the "golden tree". However, and this is quite relevant, for people from outside Landes of Gascony, mainly travelers, these pines were a grim and sad spectacle. A landscape to feed melancholy, whose geometry, uniformity and monotony provoked you dizzy; moreover, poor pine presented an unfortunate aspect, wounded, slain, raising their arms to heaven to demand justice (Muñoz, 1860, 177-179, Gautier, 1879, 13). Yet, these travelers-writers probably were unaware that the juice extracted from those "poor pines" was necessary for the manufacture of paper and ink, essential products to write down their travel experience.

On the other hand, it should be noted that forestry developed in this French region had nothing to do with the German one in that time, which during the nineteenth century became the dominant paradigm in Europe; nonetheless, both models had the same goal: turning nature into natural resource, and therefore, landscapes change (Scott, 1998, 13; Agnoletti, 2006, 384). In this regard, Arnould, Marty and Simon (2003, 92, 98), clearly stated that this forest, its creation, was part of a new logic of management that was industrial, artificial and rational, with monoculture as its biologic signature;

indeed, its success rested simultaneously on the subtle interplay of local initiatives, national wills and international context.

Spain

As in United States or France, gum resin production in Spain has had a notorious participation in landscape transformation. The difference was that in the Iberian country the State's intervention was more intense owing to the primacy of public forests.

During eighteenth century Spanish monarchy was concerned on commodities' scarcity for its Royal Navy. They tried to stop being dependent of the Scandinavian or American products. Thus, the Marquis of Ensenada ordered in 1738 the preparation of a summary report with the needs of the navy to supply it of those genres, forcing that their manufacture were made exclusively within Spain. Later on, in the last third of the century, a letter from Madrid was sent to viceroys in American colonies to ask them what kind of gums, resins, and oleoresins were available in order to supply Metropolis' industrial needs. However, it was late. Their colonies in America did not manufacture resinous products. The government could only encourage its production in certain piney regions around the peninsula, but surprisingly not in Segovian Land of Pinewoods, where there was more experience in the trade. Notwithstanding, in early nineteenth century, wood shipbuilding in Spain, as everywhere else, began its decline, and with it the interest of monarchy in fostering tar and pitch production.

In that time Spanish government was pretty busy restructuring its administration in order to become a modern state as its northern neighbor. Regarding forest managing were enacted the General Ordinances of Mountainous areas in 1833 inspired by 1827's *Code Forestiere*. These ordinances abolished traditional practices of the Old Regime and began with the intention of centralized forests administration, although real control over these resources started a few decades later, with 1863's *Ley de Montes*. A few years before, in 1854, a forestry corporation sponsored by the liberal State was created, because it was becoming clear that without them, managing aims were difficult to

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achieve. The other great factor of Spanish liberal state's construction that definitely affected the future history of the forests was the disentailment of rural property through the Act of 1855. A committee of foresters of the Corp was created to accomplish the orders of this Act. Its goal was to determine which forests to sell and which ones to keep in public ownership. The vast majority of pine forests were in latter category, which was completely crucial for the Spanish gum resin industry.

Those were the beginnings of forestry in Spain, whose first ideology, under the influence of German forestry, did not focus on non-timber forest products because Germans were concentrated mainly in lumber. However, in the different laws of the 1860 decade those resources were taken into account but with minimum attention. Amazingly, only to gum resin was devoted a very specific decree in 1865, in which was established how must be the procedure to lease public pine forests and what technique must be applied to tapping the pines and to collect gum resin. Nevertheless, this decree had no novelty. In 1844 a local decree was enacted to protect the forests and control gum resin harvesting in Coca (Segovia), in the heart of Land of Pinewoods. This regulation pretended to care the pines, but especially it was looking for an order in the exploitation and consequently in securing the fee paid by resin tappers who leased the pines. Central government had the same purpose in mind: ensure tax revenues derived from this activity, i.e. take care of the source of this income: the trees. Meanwhile chemical industries were demanding more spirit of turpentine and rosin, and since 1840's but especially 1860's, Spanish and French entrepreneurs were starting to take advantage of the numerous pine forests of the Castilian plateau in order to manufacture turpentine products.

With forest engineers in scene, traditional practices of getting gum resin were seen with repulsion, specifically the technique employed to collect the substance, which was pretty similar to Landes technique. The decree of 1865 obliged to utilize Hugues pot and follow strict measures to tapping the pines. According to them, the appliance of these methods represented the difference between the rational and the irrational. From their perspective only resin tappers that worked in public pine forests of Coca for *La Resinera Segoviana* (a gum resin industry created in 1862 by a society of French and

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Spanish entrepreneurs) were working in a rational way. In the rest of the forests not only remained old practices but people, traditionally occupied in pitch manufacture and not spirit of turpentine, resisted to adopt and obey the regulations, something that was a headache for the foresters.

The forest engineer was the bond between natural and human resources. As representatives of the State they became extremely important because everyone involved in the business had to deal with the decisions taken by them. They were in the middle, and as they became familiar with turpentine (in Forestry School they learnt anything about it) its opinion were less radical and they tried to facilitate the transition from one method to another. In this regard, last third of the nineteenth century was a period of preparation, adaptation and learning for them and for all the agents concerned. In engineers' case, the best example was when they found out that rest periods of the pinewood between tapping years were not so necessary, because while one face was tapped the previous healed; that, in their opinion, allowed to some extent protect the vitality of the pine and keep people working in the woods because they had come to the conclusion that a pine forest occupied by resin tappers was protected, and thus, preserved, otherwise, forests were left empty and people with habits out of the law could injure the woods and steal the resources.

Hence, the formula applied to facilitate the transition from one technique to another was to permit the use of the old method in pines already open while in the others utilize the new one. In their opinion, this formula satisfied everyone equally: resin tappers, owners of the forests (municipalities), and entrepreneurs (big or small). Just like pitch makers were transformed into resin tappers through a more or less long learning process, foresters were also forced to learn how to deal equally with the natural (the impact of the gum resin extraction in the pine and in the pine forest) and the social (regulations, prices, laborers, municipalities, entrepreneurs).

In Spanish legislation forest resources were divided into two categories: primary and secondary. The former was timber, the latter everything else. Gum resin was seen only as an intermediary between forest management and timber exploitation, an intermediary with economic value that should be exploited. Thus, during these years

foresters did order that this practice were made especially in crooked trees, the rest were assigned to produce timber. Despite of this, turpentine products were gaining notoriety within industrial world; accordingly, more entrepreneurs were interested in invest and more municipalities were pressing engineers to bring their forests to public auction; as a result, the perception over gum resin among foresters was changing, slowly but steady.

In some way or another, this was how began the road to the conversion of the pine forest in a crop, in this case specialized in gum resin production. Hence, the agency of the State was bound to the pine and the pine forest, ultimately to shape ecosystem, which also involved municipalities and entrepreneurs: the former to try to lease their pine forests and the latter to rent those best suited to their needs and possibilities. However, the real transformation of the forest (and with it the tapping method: its conversion into what I called “forest tapping”) took place until Management Plans started functioning in late nineteenth century.

The topography of the Land of Pinewoods is flat like in Landes and in United States' naval stores region. Like in France, the most profitable tree for gum resin was maritime pine, a different type though. The humidity of the Landes contrasts with the dry weather of the Land of Pinewoods, so the tree is bigger than Spanish pine but lives less. Maritime pine has long and deep roots like longleaf pine, just perfect to grow up in sandy soils (still it could fit as well in soils of limestone and granite, among others). Although this soil was not suitable for agriculture, in those portions where silica sands were relegated to lower soils were grown wheat, barley, chickpeas, grapes, potatoes, lentils and some vegetables. At the middle of the nineteenth century maritime pine and stone pine (*Pinus pinea*) were the pine species that dwelled in this area with a little advantage of the former over the latter: one hundred and fifty years later the presence of *Pinus pinaster* was of something about 95 per cent of the total.

Obviously this radical landscape change was due to the boom of the gum resin production in Spain. Since later 1890's until the outset of Spanish Civil War (1936-1939) the country lived its resinous *belle époque*. It was the time when Management Plans began to run in almost all the public pine forests of the area. These Plans were the long-term arrangement of exploitation and conservation of the forests. Its length can

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vary between 80 and 120 years with periodical reviews every ten years approximately, thus, initial predictions of production and preservation could be modified. Officially the ultimate aim was forest transformation and the mean gum resin production; however, between these two objectives the mean was, most of the time, the end. This was so due to the pressures that received foresters in charge of the plans, either from municipalities or entrepreneurs, to open more pines. Forest engineers had the last word to decide whether produce or transform, sometimes they surrendered to those pressures and other times they themselves encouraged gum resin production. By that time had changed the traditional division of forest resources. Forestry model was shifting from the German influence to a more suitable model for Spanish environment, where timber rarely was the primary resource. Hence, support of reforestation with maritime pine was seen as necessary in order to foster one of the typical Spanish forest resources: gum resin.

The forest, which was also the beginning of all, suffered considerable change. Gum resin was the cause and forestry the method. In this regard, the fact that from the second half of the twentieth century, when the result of the Management Plans was finally visible, turpentine had been declined almost completely. This shows the complexity to match the times of pine tapping with the transformation of the forest, because if the first was slow, the second was even more. The difference is that the former had a single goal: to produce gum resin, while the second one had two: produce and preserve. The most notable change of this double goal was setting a monoculture of maritime pines (which on the other hand, helped to improve the appearance of the trees). In addition, it seems that between the second half of the nineteenth century and the beginning of the last third of the twentieth, foresters thought only (either self-interest or by the circumstances) in pine forests, pine trees, gum resin and the people who lived of it, and only very little attention was paid on the rest of the elements that shaped the ecosystem (e.g. other forest resources such as grasses and bushes, and other living beings, such as fauna and fungi). However, what matters is that foresters priority could be connected with that of owning communities, such as municipalities, with some differences in the form but by no means in the content, namely: keeping the forest standing. Gum resin monoculture was the work of a confluence of circumstances in

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which all involved did participate in some way or another. Therefore, the loss of biodiversity has to be viewed from a historical perspective without anachronisms, because the negative effects of this loss seem deeper in socio-economic terms rather than environmental.

Conclusions

Compare three different cases in long term outlook have shown us that definitely gum resin has been participant in devastation and preservation of pine forests. Evidently it was not the principal responsible but in some moments was pretty close. In both sides of the Atlantic Ocean the aim was to produce more, that is to say, capitalism in its entire expression. However, the main responsible for both outcomes was not economic but political. Prior the production is the decision, which is not restrained to politicians but to everyone. If state, or monarchy, policies were quite decisive to the history of gum resin industries, they were far from being the only ones that mattered. Small and big holders, engineers, resin tappers, foresters, etcetera, were determinant to the resultant landscape as well. One relevant issue that makes the difference in these three countries is when, and when not, the central power took actions upon the environment. In France and United States the government began to regulate when the danger of desolation was just around the corner, respectively late eighteenth century and early twentieth; while in Spain the measures over the woods were born from the intention to modernize the administration during nineteenth century. In each case forestry science was the mean to those ends. Hence, it is important to notice which was the agency of gum resin production concerning forestry policies: in United States was the cause, in France was part of it, and finally in Spain was a consequence. At the end, the result was almost the same: monoculture (which is preferable to devastation). Unlike tar production, always located in such remote or barren areas, gum resin manufacture is a good example, with or without forestry, of how one commodity has been part of environmental change of the woods and until what point. This paper has tried to put on the table a forest resource

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not very well-known but with huge repercussions in landscape and industry. Gum resin industry is far from dying, so I think it is necessary that we must know which are their scopes and limits.

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