

## Forest Perspectives

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### Forestry in France

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*Educated as an engineer in forestry, I have worked 10 years for the French Forest Service and the French Department of Food, Agriculture and Fisheries before starting a post-MSc diploma. As part of these studies, I was invited to UCD to learn about Irish research on forest carbon storage. This internship was also an opportunity for me to make a presentation to Irish researchers on French forests and forestry practice. This article, following the presentation, is divided into three parts; history, natural diversity and economics. I would also like to share a short personal perspective of what I have seen of forestry in Ireland, however, though I still work for the French Department of Food, Agriculture and Fisheries, all opinions throughout the article are my own.*

*Finally, I would like to thank Dr Brian Tobin for having corrected and improved my original text and to apologise if any imperfections that remain.*

#### History

Knowledge of historic forest area is difficult owing to the lack of serious statistics. A land registry was first set up by Napoleon I in 1807. Before this date, only royal and church forests were mapped. Many locally defined measurement units generated confusion. Three definitions of *arpent* coexisted and ranged from 3,420 to 5,100 m<sup>2</sup>. Thus, assessments varied largely: between 7 and 15 million ha in the early 18<sup>th</sup> century. No forest inventory was achieved by royal administration. The first serious study was carried out in 1788 and was based on the Cassini's map projection, the most detailed map covering all France at this time. The total area of France was assessed then as 47.8 million ha, and forest cover as 7.6 million ha (including forests in Lorraine, which had just recently been added to the French kingdom some years before). Thus forest represented 14% of the land area.

Historical studies have shown that forest cover was very extensive during the Gauls' age (peak period in 3<sup>rd</sup> century BC). During the middle ages forests were cleared around abbeys and villages to develop farmlands. Despite a series of famines, population growth soared and put pressure on forest areas. In 1291, King Philippe le Bel created a specific Forest and Water Service to improve royal forest protection against unauthorised animal grazing and wood harvests (the latter especially prevalent in coal mining areas).

During the reign of Louis XIV, Minister Colbert aimed to create a strong Navy to fight against the English fleet and to further develop a maritime trade. In 1669 he issued an ordinance to define rules to protect forests and promote large-timber production. Each community was ordered to allow one quarter of its copse cutting forest to grow to maturity. Large areas were afforested with oak and sawmills were further encouraged near fir and spruce forests to take advantage of the larger dimensioned material. Oak

timber was specifically needed for boat hulls and coniferous timber for masts.

During the 18<sup>th</sup> century medium-scale manufacturing, heavily dependant on timber for energy production, developed in heavily forested areas; e.g. the Baccarat crystal factory or Nicolas Ledoux's royal salt factory, set up in the Vosges and Jura mountains, respectively. These large forests could meet both the demands for timber as well as for other raw materials (sand for glass and crystal, salted water etc.).

In 1789, the revolutionary government seized royal and church lands. Forests were transferred to public estate: the majority of woodlands became state-owned and areas where inhabitants had using-rights were given to the newly created *communes* to replace former parishes. Today these state forests can still be recognized by their large areas (1,000 to 15,000 ha) and the alley ways cleared for royal hunting.

### 19<sup>th</sup> century forest area expansion

In 1827 Charles X created the first version of a Forest Code of Laws. This book kept many provisions from the 1669 Colbert ordinance. It defined management rules for public forests, the so called "Régime Forestier". All public forests, even community-owned, had to be managed by the National Administration for Water and Forests, which had the monopoly for public timber sales.<sup>1</sup> Each state or community woodland had to be clearly delimited and managed according to a long-term scheme that declared how much timber could be exploited every year. Timber was sold after standing trees were marked and a check was made subsequently to see whether the markings had been respected. The company buying timber was responsible for harvesting and had to provide a financial warranty before starting to harvest. These conditions only applied to public forests, and not to private estates.

During the second half 19<sup>th</sup> century, huge works were carried out in the mountains to limit the impact of natural hazards. Many rivers were dyked and pastures on slopes were seized for afforestation to increase stabilisation. A specific administration was created in 1861 to lead these public works. "*Service de restauration des terrains en montagne*" (Mountain Lands Re-establishment Service) still deals with protection against flood, erosion, falling rocks or avalanche hazards. This date also corresponded to the last extension of France, with the addition of the mountainous Savoie region in 1860.

A notable addition to modern French Forestry was the creation of the *Landes* Forest (Figure 1). Along the Atlantic coast, the Gascogne region's shore was formed by dunes which moved with the wind. Many witnesses reported villages being buried in sand. Natural river flows were blocked and pastures suffered flooding and became so wet and spongy that shepherds needed to walk with stilts. In the early 19<sup>th</sup> century, the Ministry of Agriculture and Water led a programme to afforest these unhealthy swamps called "*les Landes*". Millions of Maritime pines were planted in an effort to dry the swamp areas, both to limit the spread of malaria and to provide timber and

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<sup>1</sup> Napoleon I created the *Prefet*, who represented the national government in each department (100 throughout France). His role consisted of overseeing the work of *communes* and ensuring that their decisions were legal, preventing corruption, managing the police etc.

subsequently employment. Afforestation was funded by banks and private citizens. Community-shared grazing was sold to banking corporations and rich bourgeois living in Bordeaux or Paris. A consequence of this was that local shepherds felt betrayed. However, this programme of works lasted about 50 years, from 1860 to the First World War, and led to the creation of the largest single woodland area in France, and in doing so, one of the more controversial moves in French forestry.



**Figure 1:** *Trenca's dune and the Landes Maritime pine forest.*

### **Recent afforestation works**

After the Second World War, France needed timber for reconstruction and in 1946 the government provided national forest funding to encourage the planting of fast growing trees. Funds were raised by a specific tax levied on each wood product sold, apart from heating wood. Private landowners were either directly grant-aided or offered cheap long-term loans to afforest abandoned farmland. Two million ha were planted over 50 years, mainly with Norway spruce and Douglas fir. Subsequently however, regions where large areas had been planted became isolated and young inhabitants tended to move away to larger towns. These regions became less and less attractive as populations dwindled. In the mountains even flat pastures were planted and villages felt ever increasingly isolated, surrounded by these new coniferous forests. In an attempt to promote a more traditional lifestyle and to develop rural tourism, many of these regions were classified as "Natural Parks". These extensive coniferous plantations were starting to change the traditional landscapes and experiments were

begun to start to clear the forests in order to regain the original landscapes. During the 1980's, ecologically minded NGO's led several media campaigns concerning acid rain and presented the recent monospecific coniferous plantations as responsible for soil acidification. Thus the National forest fund's reputation deteriorated rapidly as trees grew taller! In the meantime, as older forests matured, trees started to be harvested and sold. Forest-owners refused to pay afforestation tax any more. Finally, this fund was cancelled in 2001 by a change in forest policy law.

The last step in recent forest policy consisted of a split of Water and Forest administration into two distinct entities in 1963. The Department of Agriculture kept control of forest policy and forest management, and the *Office National des Forêts* (ONF, National Forest Service) was created in order to manage all public forests, both state-owned and community-owned forests, according to a new Forest Code of Laws. However, no land ownership was transferred to this new company. Initially, ONF was grant-aided to cover the cost of non-commercial forest management. Conditions have changed and no aid is granted any more for this role since the 2008 national revision of public policies.

Today French forests represent an area of 15.8 million ha on the mainland. ONF manages 5 million ha, of which 1.5 million ha are state-owned.

### **A natural diversity**

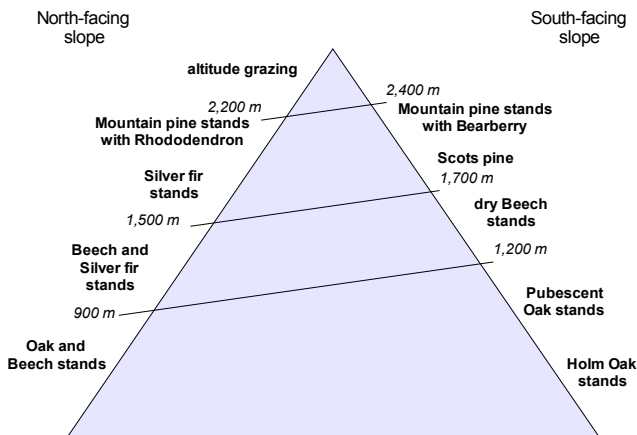
The French mainland is a 55 million hectare-wide territory, one third of which is covered by forests. Our country also covers overseas territories all over the globe, of which French Guyana with more than 7 million ha of rainforest, adds greatly to the diversity of climates, altitudes and management types. This has allowed a large diversity of ecosystems to develop and which place very different demands on management.

#### *Natural biodiversity*

Approximately two thirds of the French mainland forest area is covered with broadleaved stands. Sessile and pedunculate oak or beech can be mixed with hornbeam in the more fertile sites or with chestnut where limestone is absent. Around the Mediterranean Sea, species more adapted to hot climates grow (e.g. *Quercus ilex* L., *Pinus pinea* L., *Pinus halepensis* Mill., *Cupressus sempervirens* L.). In the mountains there is a natural succession of species as altitude increases (Figure 2). Beech occurs naturally to 1,500 m in altitude, mixed with Silver fir. The latter then become dominant until Norway spruce and finally mountain pine (*Pinus cembra* L., *Pinus mugo* Turra) appear and continue until 2,200 to 2,400 m. Higher than this, only grazing pastures can resist the arduous winter weather.

This diversity of tree stands reflects a similar diversity in ecosystems. 6.8 million ha (12.4% of total mainland area) are classified in the Natura 2000 network. A large part of preserved areas are located on sea shores and in the mountains, where biodiversity is very varied and often exceptional. Sites located in central plains represent the more common farm and woodland biodiversity. The French management system has attempted to include all stakeholders in the territories, including landowners, farmers, hunters, hikers etc., in writing together a management guide to define everybody's

role and responsibility in site conservation. This approach has posed an ownership problem in that landowners in many cases do not wish to share management of their own land with other representative groups. Negotiation and some public grants remain the best way to find solutions – hopefully!



**Figure 2:** *Vegetation succession with altitude in the Pyrenees.*

### Ownership

Forests cover over 15 million ha of the French mainland, of which private estates represent 2/3 of the area. After many inheritances, this estate has been divided into many small parcels and the mean size is often not larger than 1 ha, or less. On the contrary, state forests are still composed of huge tracts, often larger than 1,000 ha. The largest state forest, near Orleans, reaches an area of 35,000 ha, nestled in wider woodland of 50,000 ha. However, state-owned forests only represent 10% of the total mainland estate (1.5 million ha). The rest is composed of community forests which cover 4 million ha. According to the forest code of law, communities and state forests must be managed by ONF.

Relations between the state and private owners have never been easy. The former wanted to protect an estate that concerned general interest whereas the latter didn't want any constraint in managing their lands. The first idea proposed in 1913 by the Audiffred law, consisted of establishing 10-year agreements by which any private owner could let the Water and Forest Administration manage his estate. But only a few contracts have been signed to date! After World War I, the State tried to limit abuses in over cutting by reducing the maximum area which could be cut over without authorization from 10 to 4 ha.

After World War 2, though national forest funding was available, people worried about the size of afforested parcels which often appeared too small to be economically viable. Meanwhile despite a rural exodus, farmers started regrouping their lands to improve their management. This regrouping did not affect woodlands but in 1954 forest unions were created to gather small properties into larger estates which had

to be larger than 30 ha. Such unions were different from joint ownership because management decisions didn't need to be approved unanimously any more. In the beginning, forest unions were granted better financial conditions for forest funding e.g. not paying back loans before the first timber sales. However, this system has experienced mixed success, and has been most successful in rural regions of the south central mountains. Today, about 3,000 forest unions are managing c. 500,000 ha.

To ensure management adheres to law, private owners of large forests (> 25 ha) have to establish a management plan composed of three parts, namely a stand analysis, management aims and a felling and hunting programme. Documents are gathered and validated by regional private forestry councils. These official associations provide technical advice to foresters and represent them when negotiating with the timber industry or administration.

### **Management / regeneration**

For many years the main use of timber was for heating and forests were managed as coppices. In 1669, Colbert forest law enshrined the importance of large-timber production. This began the widespread planting of oak forests and their management as high forests. During 19<sup>th</sup> century, large forest areas were planted while coal and oil replaced wood as major energy sources. The 20<sup>th</sup> century has been marked by a general rural exodus and farmer numbers have dramatically decreased after World War II. Nowadays the few surviving old coppices with standards have no use any more and they are progressively converted into high forest.

Today, natural regeneration is facilitated as often as possible in order to limit management costs. This often also represents the most efficient solution. Experiments on fire-devastated Mediterranean forests have shown that, 10 years after a fire, naturally regenerated trees became larger than planted trees. Since the removal of the Forest Fund, plantings mostly consist of Maritime pine in the Landes region and poplars elsewhere. Both species have undergone genetic selection to improve wood quality and drought resistance. Other research concerns Douglas fir, European larch, ash, and cherry for occasional reforestation.

### *An insufficient harvest*

In 2008, 21 million m<sup>3</sup> timber were harvested in France, of which 6 million m<sup>3</sup> was broadleaf and 15 million m<sup>3</sup> coniferous. This volume included 11 million m<sup>3</sup> used for panels and pulp. Heating wood harvest was estimated at more than 20 million m<sup>3</sup> however, the majority of this is consumed by the owners/harvesters and is largely unknown; less than 3 million m<sup>3</sup> are sold. Taken as a whole, commercial harvest is assessed to 35.5 million m<sup>3</sup>, dominated by coniferous timber.

This result is a paradox since 2/3 of forest area is broadleaf. Volumes harvested in each forest vary highly according to ownership, accessibility, parcel area, slope etc. Coniferous harvested volume has increased steadily since 1950 whereas broadleaved harvest has dramatically decreased after the 1999 storm destruction. Beech forests have been seriously damaged and wood prices have not recovered even yet.

Many efforts have been made to collect more timber. The government has fixed new ONF targets to improve timber harvest in order to guarantee a steady supply to timber

transformation companies and to allow the industry to further develop. In the private estate the task is more difficult owing to the huge number of land-owners. Tax shields and owners' associations have not yet been successful in rationalising private timber harvests, except in the main forest regions such as the *Landes*.

Traditionally timber is sold standing; trees are marked before the sale and the customer is free to harvest them during the following two years. The main advantage is that timber not making a sale continues growing! A disadvantage is that the buyer doesn't exactly know either the volume or the quality he buys. Important defects such as beech red heart or the presence of shell fragments<sup>2</sup> can not be detected before the price is proposed. Consequently the timber industry insists on developing other methods of sale. Harvesters prefer to buy wood by product units: the agreement only concerns unit prices and the final amount is known at the end of harvesting. This system is progressively used for the cheapest timber but obviously not for higher value timber, particularly broadleaves. This grade of timber can't be standardised like coniferous material and each merchant prefers his own analysis for a sale of lumber.

Foresters who prefer to control the date and method of harvesting prefer selling roadside timber. In the mountains, winter blown conifers are quickly pulled out of forests to protect standing trees from insect attacks. Harvesting is carried out as soon as the snow disappears, a few weeks before early sales in May and June. In mixed stands, this can be difficult as different species have to be separated, very often each being sold to a different merchant. In the last 10 years, a new methodology tries to preserve the advantages of roadside timber and to maintain the flexibility of standing stock. Roadside pre-selling allows an agreement on unit prices when timber is standing. Later, the trees are harvested when the customer needs them. The timber is then analysed by both and a final price based upon real volume and quality is agreed.

### *Hunting*

The rental of hunting rights is another forest resource to be utilised. Smaller estates are managed with the rest of the community territory by the local hunting association. Any interested citizen holding a hunting licence<sup>3</sup> can become a member. Then, he can participate in collective shooting of tracts<sup>4</sup>, which is the most common way of hunting in France. In larger estates, game populations can be managed independently. As soon as an area of woodland is larger than 20 ha (100 ha in mountainous regions), the owner is allowed to organize hunting and to forbid the local association from hunting his land.

These conditions apply across the whole mainland except in Alsace-Moselle. This region was annexed by Germany between 1871 and 1918, and local law still includes special provisions inherited from German law. Thus, no local hunting association

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<sup>2</sup> Many broadleaved species growing since before WW I still contain bullets, shell fragments or barbed wire which can break or cause damage to chainsaws and saw-blades.

<sup>3</sup> Like a driving licence, there is a theory exam to test knowledge regarding safety rules, species specific requirements and season dates etc. A practical exam checks that the applicant can handle a gun!

<sup>4</sup> A group of hunters stand at the edge of a forest tract, while other hunters, beaters and dogs flush out game from cover towards those waiting at the edge.

exists and property rights apply absolutely. Moreover, the most frequent way of hunting consists of shooting alone from a hide.

As far as large game is concerned, hunters and farmers or foresters represent opposed interests; the former expect to have as much game as possible whereas the latter want to prevent wild animals from devastating their crops or their plantations. Every year, all stakeholders are gathered by local administrations to assess game populations and to determine the allowable kill in each community territory. After a hunting plan is adopted, local associations try to kill their game quota because they are financially responsible for subsequent damage to farmlands and forests. Hunters also pay a tax for shooting each animal.

Only deer and wild boars are covered by these management plans. Bird hunting is limited by official season dates but there is no maximum bag number. Finally, a nationwide list is published of animal species which can be locally classified as “pests” (weasel, marten, polecat, rabbit, fox, crow, starling etc.) Once classified, they can be trapped and killed without any limit in number or date.

#### *The particular case of French Guyana*

North of Brazil, French Guyana covers 8.3 million ha, of which 7.5 million are covered by rainforest. The population (200,000 inhabitants) lives in a few towns along the northern seashore, whereas density in the forested region is lower than 2 persons per km<sup>2</sup>. Access to the southern part of this territory is restricted and only natives (about 4,500 persons) are allowed to live there.

The equatorial climate is characterised by steady temperatures, between 22°C and 36°C. Humidity fluctuates around 80%, and rainfall varies from one month to the next. Biodiversity is so intense that more than 150 tree species can be found in one hectare and total tree species number identified and recorded is 1,300. Since the 1992 Rio Earth Summit, a project was initiated to create a national park in this territory to protect and study the included ecosystems. It was finally realised in February 2007 and 2 million ha were classified as national park. There is also a clause allowing neighbouring areas (1.4 million ha) to join.

In Guyana, all forests are public and managed by the national forest service. Yet, no complete inventory has been carried out and only 1 million ha has precise management rules. The ONF intends to identify suitable sites for exploitation. These places should gather enough commercial tree species to justify a single-use road to be built. Then, private corporations are licensed to work by specific concessions. Between 60,000 to 70,000 m<sup>3</sup> are harvested every year, though very little is exported.

The most lucrative product extracted from the rainforest is gold. Three tons are produced every year representing €36 million. The French Geological and Mining Survey (BRGM) identified deposits where extraction could be allowed and has assessed remaining reserves in the region of 120 tons. Extraction methods in the past were very polluting, releasing mercury into the environment. Today, the challenge for maintaining this gold production will be in reducing the levels of pollution.

#### *Climate change impact*

Climate change models have shown seasonal contrasts will increase during the next



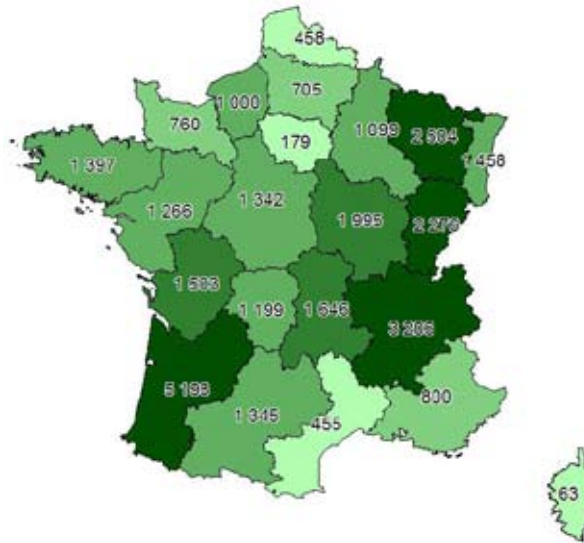
century, hot and dry summers becoming more frequent. Tree growth models suggest an increase northwards of the Mediterranean forest area, whereas areas suitable for beech could be reduced dramatically. Currently, foresters try to favour oak instead of beech since the former should better resist dry summers. However, no extensive planting works have been carried out. Moreover, since the 1999 storm, harvested beech volume has decreased from 1.9 to 1.1 million m<sup>3</sup> in line with its price reduction. The evolution of coniferous species is more uncertain owing to their location in low mountainous areas. Snow is expected to be dramatically reduced at lower levels and winter rainfall would consequently not be stored for as long a period in spring. Contrastingly, warmer temperatures would allow plants to grow for a longer season, thereby increasing the possibilities of droughts. Global consequences could be different from one species to another, but clear consequences have yet to be understood. Concerning Maritime pine, genetic research is being carried out to select more drought-resistant varieties that could maintain timber production with less rainfall.

### **An important economic sector**

In France forests provide 40,000 full-time jobs, split between two roughly equal pools. Half are employed in forest management and timber exploitation, of which 10,000 in the National Forest Service, and the other half in sawmills and other timber processing. Since the main part of harvested volume is coniferous, sawmills are mostly settled in the low mountain regions, such as Vosges, Jura, Central Massif, Alps, and in the *Landes* (Figure 3).

The main characteristic of the French timber industry is the small size of the companies. More than 2,000 sawmills were registered in 2007 which provide 18,000 jobs; among them 1,500 sawmills employ less than 10 persons. Harvesting companies are much smaller; 4,000 companies provide 8,000 jobs. This fragmentation makes sawmills weak, being caught between an important timber provider (ONF) and international construction, panel or paper groups. Standardisation makes competition easier, mainly with coniferous timber coming from Sweden and Finland. Scandinavian spruce timber arrives in Nantes harbour at a lower price than the export price from any sawmill in the Jura Mountains. French companies are therefore compelled to explore other markets to justify their price differences. Research endeavours are also directed at new product development and manufacturing methods. A national policy aims to incorporate more wood in traditional building methods and an agreement was signed in 2001 to reinforce links between large construction companies and timber research centres.

The furniture market is the second most valuable after construction; it represents a €9 billion turnover. For 30 years, this market has evolved greatly. Traditional rustic production has been split into two types, following domestic consumption. On one hand, useful and cheap pieces are made with panels that can and are largely imported. On the other, first grade modern-styled furniture is increasingly produced from veneered panels. Also, specialised retail shops have become scarce, replaced by general-interest shopping centres. Mechanisation and international competition put pressure on production costs and compel companies to manufacture abroad, to find



**Figure 3:** *Timber industry work force in each region – after Agreste, 2008.*

lower wages.

Packaging is another important outlet for low grade wood. The pallet market is mainly guided by selling prices and productivity is the master word. Thus, many companies can only compete with specialised products which exactly fit a client's needs. Health or environment standards are also useful criteria to identify specific products, e.g. material for food packaging (cheese boxes, etc.).

The pulpwood market is totally international, dominated by multinational groups. To resist competition, French foresters and woodworkers have to guarantee a regular and adapted supply of pulp grade and timber waste. Often only one, or occasionally two pulp mills are situated in each forest region and their closure would have serious consequences for the local wood industry.

For the last 20 years, low grade timber has lost traditional markets. The last iron or coal mines were closed in the 1980's and high speed railways are now built using concrete sleepers. Moreover, recycled wood can be used to produce panels or pulp. In this context, heating wood appears both as an environmentally friendly energy source and as a new outlet for wood waste. Technical innovation encourages increased wood usage in town buildings such as schools, sport halls etc. The stakes are now high with the image of logs lying by the fireplace about to change for ever!

#### *Irish forests as seen by a French forester*

My internship has given me the opportunity to learn about Irish forestry, while my weekends have been spent in travelling across the island. The most impressive aspect of Irish landscapes is the way that every small parcel of land is being used, either for grazing, for tillage, bog or forest exploitation. I've felt Irish people are deeply

attached to their lands and they make strong efforts to maintain and value them.

However, at the end of my stay, I worry about two points. First, Sitka spruce monocultures appear to me hazardous given they represent over half of the Irish forest estate. A few years ago, I witnessed the remarkably quick development of bark beetle populations in Norway spruce stands damaged by the 1999 storms. Also, the *Landes* forests are increasingly subject to damage from foliage feeding caterpillars, the most serious damage occurring after trees have been weakened during a hot summer. So I wonder, what the consequences would be if continental insects find their way across the Channel and Irish Sea?

Secondly, a large area of forest has recently been planted; almost half of the total estate is younger than 25 years. So, I wonder how a wood industry can adapt to this production peak. Investments can be made if production is sustainable and steadily reliable. If such a large proportion of forest is managed with a similar growth rhythm, the production peak could be followed by a significant gap. Such quantity variations would have serious consequences on wood prices, and markets would have to find a “natural” balance. Forest-owners want/need to sell timber mainly when prices are high enough to cover costs, which if every one comes to the market at about the same time, cannot happen. Changes in thinning practice might indirectly reduce stands growth speed while a market is not yet ready to integrate the additional supply. Today, many forests are in the first rotation, stands and properties are even-aged and growing at the same rhythm. But regeneration will be an opportunity to bring more age diversity to the stands. In the meanwhile, clearfelling could be staggered from 40 to 50 or 60 years-old. Other methods of regenerating could also be experimented with, both to prevent clearfells, to save planting costs and, most of all to follow both the industry’s and greater society’s needs and expectations.

As a conclusion, Irish and French forests have been confronted with many of the same challenges. The main difference is linked with the period of the industrial revolution, which occurred later in France than in Northern Europe. This allowed France to preserve her forests by using coal directly instead of timber. After this period, large planting works have been carried out in both countries, mainly with conifers, to provide a ready supply to build and support a timber industry.

Today, Ireland and France have to adapt their forest estates to the international timber market. The former is developing its wood industry to transform the newly available resource. The latter tries to speed up the growth of its old rustic oaks and to find them further use beyond barrel making.

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