

STUDY TOUR TO BELGIUM 1989

DAY 1: TUESDAY 30th MAY

After a coach journey through southern England, punctuated by an overnight stop at Reading, we crossed from Dover to Ostend and stayed in the city of Bruges. Early on Tuesday morning we travelled eastwards through the flat countryside of Flanders to the coast at Den Haan. Baron Alain de Jambline, President of the Royal Belgian Forestry Society, introduced us to Ir. De Schuyter and Ir. Vitre from the Forestry Division of the Environmental Planning and Land Use Department of the Ministry of the Flemish Community. Ir. de Schuyter gave an outline of forestry in west Flanders. Forest cover in the region is very low accounting for just over 2% of the land area and is almost exclusively recreational and protective in use. Nationally forests account for 20% of the land area.

The woods at Den Haan were originally planted to arrest inland dune migration. The earliest plantings began in the 18th century but these have all disappeared and the present woods are mostly thirty to forty years old.

Before any planting begins the dunes are first stabilised using brushwood shelters and marram grass. The brushwood is placed in parallel rows about 1.5m high, 5-10m apart. When the sand is stabilised to some extent, shrubs such as sea buckthorn, willow and privet are planted. These bind the sand further and give protection from exposure and salt winds to the trees planted further inland.

The dunes at Den Haan are from 500-900m wide and the plantations cover an area of 152 ha. The plantations begin about 150m from the high water mark

and are mainly comprised of Corsican (*Pinus nigra calabrica*) and Austrian pine (*Pinus nigra austriaca*). Smaller stands of broadleaves such as oak, poplar, white poplar and maple also occur. Of the conifers Austrian pine is the most resistant to salt wind and exposure. However, its form is very poor and its productivity low, an average of 3-4 m³/ha/annum. Corsican pine is confined to the more sheltered inter-dune flats and reaches reasonable size with an average increment of 6-7m³/ha/annum. One stand located 700m inland, planted in 1926, carried a volume of 419 m³/ha on 600 stems. The policy in these older stands is to gradually open up the canopy and encourage the growth of broadleaved species and manage these under a coppice with standards silviculture. This ensures the site is always covered by vegetation. Coppice regrowth is cut on a 10-15 year cycle. The favoured species are maple, white poplar and oak (*Quercus robur*).

The introduced black cherry (*Prunus serotina*) regenerates prolifically and is spreading in all plantations. It is however, regarded as a weed species and is removed during cleaning and thinning.

Attempts are also being made to establish plantations of broadleaves. These however have had mixed results. The high exposure and low moisture holding capacity of the sandy soils makes establishment difficult. Measures to counteract this include using moisture retaining products in the planting pit ('Hygromul' for example) and tree shelters. The latter have been used for two planting seasons but have not given very promising results.

While the protective function of the plantations is still important the woods are a very important amenity in an area of low forest cover. Pathways have been made through the woods and much of the time the staff is spent maintaining these. The high level of public use of the dunes is preventing natural regeneration from developing fully.

From Den Haan we moved to a nearby inn where we had a very pleasant lunch with our hosts. This included a rendition of an Irish air on the pipes by one of the Belgian foresters.

After lunch we moved inland, across the flat polders, south-westwards to the state plantations at Koekelare and the famous stands of Corsican pine (*Pinus nigra* "Koekelare"). The Parceel Vrouwenvijverl - Bestaad H1 was planted in 1882 with a mixture of pine and European larch. The stand development details were given as follows:



Lunchtime entertainment by a Belgian forester.
(Photo: D. Keane)

The stand has a top height over 30m and a mean tree volume of 4.5 m³. The intention is to retain the stand for as long as possible. Thinnings make in the region of 800 Belgian francs/m³ (standing).

Table 1: Stand Development History of Koekelare Corsican Pine

Age	Main Crop				Thinnings				Average annual volume increment m ³ /ha/year (Pine)
	/ha		Larch /ha		/ha		Larch /ha		
p1882	N	m ³	N	m ³	N	m ³	N	m ³	
18	538	-	254	-	-	-	-	-	-
27	-	-	-	-	174	13	117	5	-
8	364	-	137	-	174	13	117	5	-
51	219	374	21	15	319	100	233	40	9.3
1933-40	-	-	-	-	337	132	239	45	-
65	196	445	-	-	338	133	246	50	8.9
70	179	478	3	5	359	157	251	55	9.1
74	179	505	3	5	359	157	261	55	8.9
83	163	530	3	5	375	184	261	55	8.6
87	146	-	3	5	392	220	261	55	-
91	146	598	0	0	392	220	254	60	9.0
98	146	607	0	0	398	234	254	60	8.6
107	135	609	0	0	403	255	254	60	8.1

Table 1 (contd.) Periodic increment

Period: 1973-79		Period: 1980-89	
Volume 1973 =	598 m ³ /ha	Volume 1980 =	607 m ³ /ha
Volume 1980 =	607 m ³ /ha	Volume 1989 =	609 m ³ /ha
Thinning Volume =	14 m ³ /ha	Thinning Volume =	21 m ³ /ha
Total	621 m ³ /ha	Total	630 m ³ /ha
Increment 23 m ³ /ha over 6 years = 4 m ³ /ha/annum		Increment 23 m ³ /ha over 8 years = 3 m ³ /ha/annum	

After visiting the main stand at Koekelare we moved to an adjoining plantation of Corsican pine, 44 years old. Over the past four years the stand has become badly defoliated. Similar damage has occurred in other Corsican pine stands in West Flanders. The main cause is thought to be ammonia produced from pig farms adjacent to the plantations. The region has also experienced three severe winters in a row and this is believed to have exacerbated the problem. The extent of the damage in the area is shown below:

From pig farming and forests we moved up the road to a small 3.5 ha clearfell dating from 1980. Most of the area has been colonised by Corsican pine seedlings. The remainder has been planted with oak and birch seedlings which have been allowed to develop in wet patches. Herbicides were used but there was a bad public reaction and they have not been used subsequently.

Before leaving Koekelare the President, Bill Wright paid thanks to the staff of the west Flanders Forest Service. Each of our hosts was presented with

Table 2: State of Health of Forests in West Flanders.

Region	Degree of damage	Distance to a source of emission (piggery)	Estimated total N production in region (kg/ha agricultural land/yr)
Zedelgem-Vloetemveld	●	200m	485
Koekelare-Koekelarden	●	200, 400, 600m	378
Beernem-Bulskampveld	●	500m	444
Tillegem-Tillegembos	●	500m	485
Brugge-St. Andries	●	500m	276
St. Andries-Karvijn	●	500m	276
Ichtegem-Wijnendalebos	●	1km	484
Sijsele-St. Jansbossen	●	1km	270
Sijsele-Rijkevelde	* (trace)	2 to 3km	270
Oostkamp-Nieuwenhove bos	●	3km	573
Zonnebeke-Staatbos	*	more than 3km	374
Ursel-Drongengoed	*	more than 3km	434
Eeklo-Het Leen	*	more than 3km	470



Members of the West-Flanders Forest Service at Koekelare.

(Photo: F. Gibbons)

a polished section of bog yew (*Taxus baccata*) from Clonsast bog. From there it was back to Bruges where Baron de Jambline took the group on a tour of the very attractive old city centre of Bruges.

Eugene Hendrick

DAY 2: WEDNESDAY 31ST MAY

Morning

Day two of our Belgian Study Tour commenced as our party departed Novotel Brugge in bright sunshine and joined the main motorway from Ostend to Brussels. We were heading south towards our first stop, the "Geographic Arboretum of Tervuren". On route we passed the city of Ghent, and former capital of the Counts of Flanders. Soon we were on the outskirts of Brussels and passing through part of the Foret de Soignes, we arrived at our morning stop.

Here the Baron de Jambline introduced us to Mr. Michael Terlinden, Secretary of the Royal Belgian Forestry Society, our hosts in Belgium. Baron de Jambline also introduced us to Mr. Stan van Dievoet, Steward of the arboretum and our leader for the morning. Mr. van Dievoet welcomed the Society to Belgium and introduced us to the background and role of the arboretum.

The Capuchin Wood, from part of which the arboretum was created, obtained its name from a monastery that existed here from 1626 to 1796. It has an area of 310 hectares and is situated at the perimeter of the Foret de Soignes. Between 1822 and 1843 the forest was almost completely cleared and most of the land was cultivated. It was replanted by King Leopold II from 1875 onwards, during the period of the implementation of the policy of the "Green Spaces", with

a mixture of broadleaved species, mainly beech, oak, elm and ash.

In 1903 the King bequeathed these properties to the Belgian people with a view "to conserve, close to the large towns, free spaces with natural decorations in an atmosphere which is aesthetic and hygienic".

It is to Prof. Charles Bommer (1866-1938), conservatore of the State Botanic Garden and holder of the Chair of Geography and Plant Palaeontology at the University of Brussels, that the idea of establishing an arboretum must be credited. In contrast to the classical arrangements, in which the species are ordered in systematic taxonomic fashion of genera and species, the Geographic Arboretum of Tervuren was created in a style to represent the forest associations most typical of the temperate zone of the Northern Hemisphere.

Extending to around a 100 ha in area, the arboretum has two sections: the old and the new continent covering 65 and 35 ha respectively. Each of the sections is subdivided into 20 groups representing many natural associations and characterised by one or more species properly identified. In total there are 460 woody species in the arboretum of which 155 are gymnosperms and 305 are angiosperms.

The arboretum is located 12 km south-east of Brussels, at an average altitude of 100 metres (80-115m). It enjoys a maritime climate which is temperate and favourable for tree growth. The average annual temperature is 9.4°C. The average rainfall per annum is 780 mm. Late frosts are frequent and damage occurs in the conifers with early growth.

Mr. van Dievot then led our party on

a conducted tour of the arboretum. We entered by the principal entrance from the crossroad of St. John and our tour commenced in the section devoted to the New World and particularly by the west coast of North America. This is the homeland of Douglas fir, *Tsuga heterophylla*, many spruces and sequoias and it was here that our party felt most at home.

Another group represents central coastal Alaska and was planted between 1965-1968. As well as Sitka spruce, this forest type also consists of western hemlock (*Tsuga heterophylla*), red alder (*Alnus rubra*) and western balsam poplar (*Populus trichocarpa*).

Moving south into the British Columbia group we found Sitka spruce in mixture with western hemlock, Nootka cypress (*Chamaecyparis nootkatensis*) and western balsam poplar.

From here we followed the coast southwards and reached Vancouver Island where in association with the previous species we found Douglas fir (*Pseudotsuga menziesii*), western hemlock, grand fir (*Abies grandis*) as well as broadleaved species like red alder with a shrub layer of vine maple (*Acer circenatum*).

Continuing our journey we left the coast and approached the Cascade mountains. At the lower elevations, up to 700m, the same composition of species occurs. The midslope forest type is mainly composed of grand fir with Douglas fir and western hemlock. At the highest levels grand fir is replaced by Noble fir (*Abies procera*). Finally mountain hemlock (*Tsuga mertensiana*), Engelmann spruce (*Picea engelmannii*) and lodgepole pine (*Pinus contorta* var *latifolia*) all grow almost to the

timberline.

Our travels next took us to the state of Washington and as we go around the Puget Sound we arrive at the Olympic Peninsula where Sitka spruce is the dominant species especially in the "Olympic rain forest".

In the coastal chain of Oregon beside the classical mixtures of Douglas fir exists a type, limited to the coastal forests, characterised by Lawson cypress (*Chamaecyparis lawsoniana*) in mixture with western hemlock.

Further south in the northern Californian coastal chain occur the giants of the plant world, the coast redwood (*Sequoia sempervirens*). While very sensitive to the Belgian climate, three specimens of this species have survived, protected by the surrounding Sitka and western hemlock. In the same region but at much higher elevation, mixed stands of Colorado white fir (*Abies concolor*), western yellow pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*) with Douglas fir and western red cedar (*Thuja plicata*) occur. Also in this group red fir (*Abies magnifica*), Brewer spruce (*Picea brewerana*) and sugar pine (*Pinus lambertiana*) make their appearance.

Towards the interior of the American continent the Sierra Nevada mountain range is home to a number of species of which the most spectacular is Wellingtonia (*Sequoiadendron giganteum*). Others in this group include white fir, red fir, western yellow pine, Jeffrey's pine (*Pinus jeffreyi*), lodgepole pine and incense cedar. The Wellingtonia are the tallest trees in the arboretum at 33 m with a circumference of 4.5 m.

The final part of western North America represented was Montana with a dis-

tinct proportion of more elevated forest of western white pine (*Pinus monticola*) at elevations of 650 to 1500m. This forest formation has been given the name of "The Western pine region".

We concluded our trip by contrasting the west coast of America and its predominance of coniferous forests with the east, where broadleaved species tend to dominate.

A lively discussion concluded our visit to Tervuren and many of us vowed that we would return again at some future time to this wonderful place. Before we departed, our President, Bill Wright thanked Mr. van Dievoet for a most interesting and informative guided tour and presented him with a disc of bog yew on behalf of the Society. We then boarded our bus and headed off for lunch at a local hostelry.

Afternoon

Our afternoon stop was at the Forest Research Station at Groenendaal-Hoeilaart just outside Brussels. Here Baron de Jamblin introduced us to Dr. Nanson, Director of Forest Genetics Research, and our leader for the afternoon.

Dr. Nanson welcomed the Society to Groenendaal and gave us a brief outline of forestry in Belgium. Forests cover 20% or 600,000 ha of Belgium with approximately 50% owned by State and 50% owned by the private sector. About 50% is broadleaved woodland while the remainder is coniferous forest. Average production is about 5 m³/ha per annum at the moment but it is hoped to double this to 10 m³/ha per annum through continued research and development. The overall increase expected through genetic improvement is 60% with a breakdown as follows: 20% by improved prov-

enance choice, another 20% through the use of quality seed from seed orchards and a further 20% gain is expected by using selected improved individuals in clonal forestry. The quality of the wood produced will also be improved and will command much higher prices.

Dr. Nanson then gave us an outline on the research work undertaken at Groenendaal. The earliest research work, in forest genetics in Belgium, began about 1900 and started with provenance experiments in Scots pine (*Pinus sylvestris*) which were established by the station. Many European foresters also became aware of the importance of racial variation in Scots pine at this time when many of their plantations failed while others grew successfully. As a consequence foresters paid greater attention to the use of seed of the correct provenance. About 1935 the "Comptoir et Secherie des Graines de L'Etat" was established and based at the Research Station at Groenendaal. Its purpose was to sell seed of best genetic quality (correct provenance) for afforestation in Belgium.

From 1950 onwards a programme of selected "plus" seed stands and plus-trees was initiated. Several provenance and progeny experiments mainly with Scots pine, Corsican pine (*Pinus nigra*), Douglas fir, Norway spruce (*Picea abies*), with pedunculate (*Quercus robur*) and sessile oak (*Quercus petraea*) and beech (*Fagus sylvatica*) were established. At the same time, a programme for the establishment of seed orchards in central Belgium, in conjunction with the Forest Service, also commenced.

During the period 1960-1970 the programme for establishing "seed orchards"

was developed and the first orchards were put in place. In 1966 a study group for the improvement of forest species was created to identify the best and most suitable provenances for Belgium. As a result of this study, the best provenances of Norway spruce, Douglas fir, Corsican pine and larch were identified. Work on broadleaved species, especially beech, oak and cherry (*Prunus avium*) was also started.

In continuation of the programme of improvement for all species the plan of action has the following chronological sequence.

1. Study of provenance:

Provenance trials permit the long term comparison of the indigenous and introduced exotic populations of a species and the selection of the most suitable for Belgian forestry. These populations also provide gene-pools for further breeding work.

2. Selection of seed stands:

The selection of seed populations, that is the best stands in the country from the phenotypic viewpoint and their registration in the National Catalogue of Seed Stands. To date over 1000 ha of seed stands are officially recognised for all the principal species.

3. Selection of individual

Plus Trees:

This programme ensures the selection of the best individuals based on phenotypic characteristics such as growth, vigour, straightness and resistance to insect and fungal attack.

4. Establishment of seed orchards:

The best "plus trees" selected are propagated through grafting or cuttings and planted in orchards. The continuous observation and comparison of these

progeny allows the determination of the genetically superior trees and the best individuals. This permits the establishment of elite seed orchards.

5. Development of multiclonal varieties:

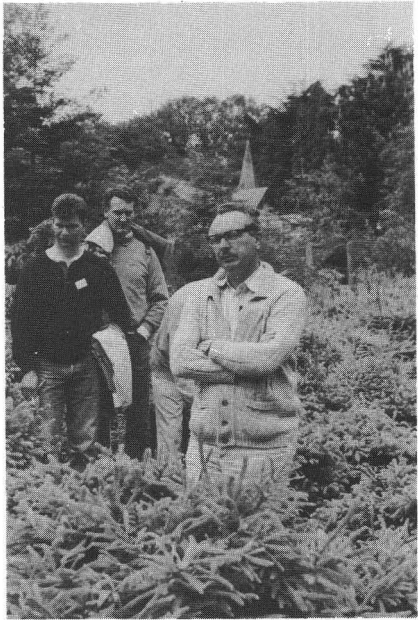
From the beginning, the best plants from the most suitable provenances and the better progeny from seed orchards were selected. Today young clones are selected in the nursery and propagated vegetatively by cuttings with a view to creating multiclonal varieties of high genetic quality.

Species improvement programme:

This programme's main objective is to increase the economic returns from the principal forest tree species. For conifers, the main emphasis is on spruce, Douglas fir and hybrid larch. These species represent over 75% of the annual reforestation programme for Belgium. Research on broadleaved species is mainly concentrated on the oaks including American white oak (*Quercus alba*), cherry and ash. Other work includes the development of a multi-clonal variety of western red cedar (*Thuja plicata*) with resistance to acid rain.

Tour of the station:

Dr. Nanson led the party on a guided tour of the station. Our first stop was in a grafting house where Douglas fir had been grafted by the side veneer method with 50% success. A major problem with Douglas fir grafts is that of plagiotrophic growth which remains for a number of years in the field. The next stop was at a collection of the best clones of Norway spruce now hedged to produce material for cuttings. These clones were of selected material from the Ardennes



Dr. Alphonse Nanson (foreground) with group members in the Norway spruce clonal garden at Groenendaal.

(Photo: D. Keane)

which has proven to be the best and most suitable provenance location for use in Belgium. Provenance tests have demonstrated that sources from Germany and Poland are much inferior in comparison with native sources. Already 200 of the best Norway spruce clones are available commercially in Belgium.

The cutting programme with hybrid larch (*Larix x eurolepis*) is well advanced. Hybrid larch cuttings are taken fresh from the selected hedged stock and the cut ends are dipped in a rooting powder. These cuttings are then inserted in raised beds in the open nursery and are rooted by September but will remain

undisturbed until the following spring. It is estimated that the cost of plants produced by cuttings is double the cost of plants produced by the conventional system.

From here we moved into the seed orchard area. The first, a Scots pine orchard, established in the early sixties, began to produce cones after five years and was in commercial production after ten years. Collection of cones is usually in January after the first heavy frost and average production is 5/10 kilograms per hectare. Other orchards established here are Corsican pine of Koekelare provenance, as well as larch and Douglas fir.

Our final stop for the day was a tour through the arboretum attached to the research station at Groenendaal with Dr. Nanson as leader. The arboretum was established around 1900 and many of the species have reached the end of their natural life, for example wild cherry. The arboretum is 13.5 ha in extent and has a total of 480 taxa.

Time as ever soon caught up with us and our visit had come to an end. The President, Bill Wright, thanked Dr. Nanson on behalf of the Society. Having said our final goodbye, we were on the road once again heading south towards the Ardennes and our overnight stop at Namur.

John Fennessy

DAY 3: THURSDAY 1st JUNE

On Thursday morning, June 1st, the study tour continued as we travelled to the south-east towards the Ardennes region; the heartland of Belgian forestry. On route from Namur to Vielsalm we saw some spectacular forest sites side by side with agriculture. Some of these

sites included large blocks of afforestation, some area of reforestation and some large Christmas tree farms. The journey had taken us from the sparsely afforested region of the north into the densely afforested region of the south. In this region of Belgium 20% of the total land area is under forests. On arrival in Vielsalm we were met by Dr. P. Gathy and travelled a short distance to the great private forest, the forest of Hodinfosse where we were met by Mr. J. P. Van Zuylen, the present owner and his son-in-law, Mr. A. Thill.

The Forest of Hodinfosse.

The forest is situated in the High Ardennes at altitudes between 400m and 565m in the parishes of Vielsalm, Grand Haileux and Trois-Ponts. Mr. Jacques Orban de Xivy, the great-grandfather of the present owner was the originator of this forest, with the acquisition of 500 ha of scrub in 1852.

The development of the forest occurred in three main stages; the first stage from 1852 to 1900 with the transformation of the scrub to plantations of *Pinus sylvestris*, the second stage from 1900 to 1955 with the introduction of Norway spruce and beech and the third stage since 1955 with the introduction of Douglas Fir and Japanese larch.

The forest of Hodinfosse now covers more than 800 ha comprising 85% conifers (Norway spruce, Douglas fir, Japanese larch and Sitka spruce on the summits) and 15% broadleaves (oak and beech). The soil is mainly acid brown earth, stony and about 80 cm deep. Annual rainfall is 1500 mm and the average temperature is 7°C.

As we travelled through the forest we learned of the objectives of Mr. Van

Zuylen and his foresters;

(1) To produce, in the nursery of the estate, forest plants of which the seeds and distinctive features have been recommended by the research station of Groenendaal.

(2) To give preference to plantations of Norway spruce rather than to natural regeneration, to tolerate the natural regeneration of Douglas fir and to do research on Sitka spruce.

(3) To replace Norway spruce and silver fir with Douglas fir, Japanese larch, Noble fir and Sitka spruce.

(4) To maintain 15% broadleaves (oak and beech) and 85% conifers.

(5) To attain a normal distribution of age classes.

(6) To reduce rotation of Norway spruce from 70/75 to 60/65 years.

(7) To progressively increase the annual cut to 10,000/11,000m³ by the years 2020/2030 from the present 6000/7000m³.

(8) To practise a policy of thinning of 3 to 4 ha/annum in preference to cutting with regeneration.

(9) To achieve a road density of 4/5 km/100 ha.

(10) To prune 400/500 stems/ha Douglas fir and larch.

(11) To ensure an equilibrium between flora and fauna. At present there are twenty-five deer and one hundred roe deer per thousand hectares.

(12) To hand down the property of the forest from the present owner.

Our first stop in the forest was in a stand of Douglas fir and Norway spruce, planted 1917.

Measurements taken in May 1985:

Number of trees: 180/ha of which 110 were Douglas and 70 Norway spruce.

Dominant height: 40.8m for Douglas, 33m for Norway spruce.

Basal area: 43.3m²/ha of which 34.5m² was Douglas and 8.8m² was Norway spruce.

Average circumference: 198cm for Douglas, 126cm for Norway spruce.

Standing volume: 684m³/ha of which 523m³ was Douglas and 125m³ was Norway spruce.

Mean tree volume: 3.6 m³, 4.8m³ for Douglas and 1.8m³ for Norway spruce.

Our second stop was at a Douglas fir stand planted 1950.

Spacing: 1.8 x 1.8m

Measurements taken in 1987:

Number of trees: 460/ha

Basal area: 32.5m²/ha

Average circumference: 74cm

Standing volume: 347m³/ha.

Mean tree volume: 0.754m³.

Our third stop took us to a stand of Douglas fir planted in 1932.

This plantation was laid down according to the Anderson method.

Measurements taken in 1987:

Number of trees: 320/ha

Top height: 33.5m

Average circumference: 131 cm

Standing volume: 552m³/ha

Mean tree volume: 1.7m³.

Our fourth and final stop was at a plantation of Douglas fir planted in 1959:

Spacing: 1.5 x 1.5m with a mixture of Norway spruce.

Measurements taken in 1987:

Number of trees: 960/ha of which 900 were Douglas and 60 were Norway spruce.

Top height: 24.8m.

Basal area: 30.4m²/ha of which 29.2m²

was Douglas and 1.2m² was Norway spruce.

Average circumference: 64 cm for Douglas and 51 cm for Norway spruce.

Standing volume: 271m³/ha of which 266m³ was Douglas and 11m³ was Norway spruce.

Average volume tree: .289m³, .296m³ Douglas and .178m³ Norway spruce.

These figures provide us with an awareness of the silviculture applied by Mr. Van Zuylen to Douglas fir. It is deliberate policy to remove weaker trees because he wanted to get trees with choice branches and form, which could be cut down and which will give the least number of knots, thus producing woods of the first quality category.

In the forest of Hodinfosse insects and diseases are not a problem. There is no treatment used for the prevention of *Fomes* as they do not consider it a serious problem. Fires resulted in the loss of 100 ha of pine in 1986.

The commercial aspects of the forest are looked after by "Forestar", a limited company founded by forest owners. Its objective as a company consists of the exploitation and sale of wood belonging to its shareholders. The company looks after the interests of workers, deals with the users of the timber (sawmills, papermills etc.) and tries to obtain the best price possible for the timber and also establishes the needs of the consumer.

The contract between the owner of the wood and Forestar is as follows:

The forest owner, who may or may not be a shareholder of Forestar, decides for himself the management situation and volume of his felling. He proceeds through "hammering" that is establishing a catalogue indicating the number of

trees per category and by species. The contract of purchase is signed between the supplier and buyers. The exploitation and commercialization is made in the best interests of the suppliers. The payments are effected on the basis of five slices (samples) to provide a provisional estimate. The wood supplier can take account of the cost of exploitation and the sale price of the harvested products. The forest owner undertakes to follow the rules of the company, which are based on respect for the rights of the individual and on mutual trust.

All in all we had an enjoyable and informative morning in the private forest of Hodinfosse. Mr. Van Zuylen and Mr. Thill had shared their knowledge and long experience in silviculture of Douglas fir and spruce. An interesting point not already mentioned, was the volume increment of Douglas fir over 40 years:

- 40 years – 1m³
- 50 years – 2m³
- 60 years – 3m³
- 70 years – 4m³
- 80 years – 6m³

Following lunch in Vielsalm we travelled to a nearby private sawmill. At the sawmill we met Mr. de Hepecee, sawmill manager. The sawmill was set up originally by a group of forest owners to sell small softwood. It has recently benefited from a capital investment of some 300 million Belgian francs, and is now one of the most modern sawmills in Europe. It has been in production since early 1989 and while there seemed to be some slight teething problems along the line and some areas where improvement could be effected, when in full production it will be capable of sawing up to 800



Study tour group at sawmill near Vielsalm in the Ardennes.

(Photo: D. Keane)

m³ per day. The new mill saws both large and small sawlog.

One of the most unusual features to begin with was that there was no stock-heap in the yard. Twenty trucks of timber enter the mill daily, each truck carrying 40m³. Best results are achieved by sawing the fresh wood, also best prices were attained for fresh saw-dust and chips. The logs are loaded from the lorries into the racks which moved them onto a conveyor where they travel along through the debarking machine. From there they travel through a computer device for detecting metal in the wood (from the war years). Any logs that contain metal are stamped and discarded, the detector marking the area on the logs where the metal is situated. The logs then pass through a computer which give a graphic portrayal of the tree. The dimensions of the tree are then read by a sawing programme and

the log is sawn into planks and is further broken down to its various sizes as it travels through the mill. As the logs pass through the computer the volume of wood is measured and the workers are paid accordingly. All workers are paid similarly thus ensuring maximum production. One man operates each of the two main computerised saws and there are a number of other men situated at various points along the line. Fifty men in total are employed at the mill. The logs, having been broken down into final sizes are then cross-cut and go through an automatic sorting system. This system is a new installation and is certainly very labour saving. As each board has passed over its particular size category, a device lowers it into the appropriate rack.

Kiln unit

The sawmill has the most up to date

computerised drying kiln. The kiln was set up by three large sawmills in the east of the country. It was constructed in 1984 and started working in 1987. There was a total of 40 million Belgian francs invested in the unit. It consists of three cells, 1 x 80m³, 2 x 40m³, and is of the multi-combustible type. It is run on sawdust, bark and leftover pieces of wood. The feeding of the oven is automatic. The hot air circulates in the drying cells due to the action of ventilators. The current of air goes in one direction at a low point and also enters at the opposite direction at a low point, causing evaporation of water in the sawn wood. The drying time varies from three to eight days, depending on the size of the planks, the amount of humidity in a batch as well as the general humidity levels. The timber is dried to 12% moisture content for joinery and 18% for structural timber. Drying is controlled by computer. For each of the cells, five probes are placed in the wood, which relay to the computer temperature and moisture levels. The drying technique is an art – dry too quickly and the wood will split, dry too slowly and operation costs increase. At present the kiln is capable of drying 12,000 m³ per year and this could be doubled by adding additional drying cells without necessarily changing the oven. The kiln is operated by one man and has a specialist electronics technician and a mechanic for three days a week.

The sawmill has a recovery rate of 60% underbark. All the timber is utilized, the waste (sawdust, bark and sweepings) is used to fuel the kiln as described. Wood is also sawn into very small sizes, laths etc. Top prices are paid for the chips which are used in the

production of high quality paper. The softwoods sawn have numerous uses, wooden frames for housing, rafters, furniture, garden furniture, shutters etc. Market outlets for the timber include France, England, Holland and Germany. A very good market is available in Germany due to its close proximity (20 Km). Douglas fir commands high prices, as it is used in veneer quality wood.

Our visit to the sawmill was very interesting and thoroughly enjoyable. It is an extremely impressive operation with the most modern technology and machinery employed. Earlier in the day we had seen some fine stands of timber – Douglas fir, Norway spruce and larch – trees with good form and volume and later that afternoon in the sawmill we watched the logs being transformed from round wood to sawn wood, through one of the most modern sawmilling processes in Europe.

Frank Gibbons

DAY 4: FRIDAY 2ND JUNE

On the fourth and final day of the study tour we visited part of the south-west corner of Belgium, near to the border with France.

Leaving our hotel at Namur in the morning, we travelled south, gradually rising up into the scenic Ardennes region. The Ardennes rise to about 600 metres above sea level and are cut from east to west by a series of rivers. As a result all of the roads going north-west are very undulating. Clay soils predominate and these are difficult to work, being dry in summer and wet during the winter months. The underlying bed rock, schist, is of very poor structure.

Some 70 kilometers from Namur we reached the public forest at St. Hubert. On our arrival at the meeting point, Baron de Jambline, who had continued to travel with us, introduced the group to the local forester Mr. Charue. Mr. Charue welcomed us and went on to introduce the forest with the aid of detailed maps. He manages some 6,000 ha of land, of which 41% is broadleaved forest (mainly beech), 47% Norway spruce forest and the remainder nature reserve.

The elevation is about 580 metres and average temperatures range from 0°C in January to 13°C in July. Rainfall averages about 1000 mm per year. Snow lies on the ground from December to April.

A certain amount of hunting for roe deer and boar takes place throughout the forest. Animal numbers, especially deer, have to be controlled if successful regeneration of beech is to take place. Generally, however, the game is poor as the vegetation is poor. It is this vegetation which classifies the beech forest growing above it. Birch grows at high levels on peat, and a small amount of oak occurs in pockets of good soil.

During the morning we were concerned mainly with beech and Norway spruce silviculture. Starting with beech, and close by the meeting point we saw natural regeneration. This, however, was very patchy due to grazing from deer. The crop was about 200 years of age. Small openings had been made in the canopy to encourage regeneration.

A short walk through the beech led us to an unplanted area which had been cleared of a crop of Norway spruce. Some of this still remains and is very poor. The intention is not to replant

again as establishment costs would be too high. Some of the tour party suggested Sitka spruce as an alternative species and mounding as a method of cultivation. Ground conditions were quite wet. The area will be left bare and incorporated with the birch woodland close-by as a nature reserve. This was indicated by a sign with a drawing of the wild flower *Trientalis* which is the symbol of Belgium nature reserves. Where we stood it was very common among the flora.

Bark beetle populations fluctuate from year to year. Two successive mild winters and the effects of natural predators and fungi have reduced their numbers. Even so, attacks have occurred on some of the Norway spruce. They will attack trees which are stressed, eating into the bark, and encouraging a fungus to develop which eventually causes the tree to die. Eggs are laid in May in the bark of the trees. A pheromone trap was placed to trap the beetles. The chemical is similar to that given off by beetles when they attack trees and attracts other beetles. In one year a trap can catch about 10,000 beetles.

Unlike beech, natural regeneration of Norway spruce is not encouraged for a number of reasons. Firstly, the identity of the seed is unknown. Secondly, it is expensive to thin and finally roots of naturally regenerated trees don't go as deep as planted ones.

Back on the bus, we drove a short distance to an area of Norway spruce planted in 1876. In 1962 this crop went through a planned transformation. The idea was to develop a stand of different ages and species. It wasn't a success. Young trees have been cut back by deer. At present, management is diffi-

cult owing to the variety of species. As well as cutting the beech, deer remove the bark of the spruce. In order to keep them from damaging final crop trees the bark is scribed in several places. The resin seemingly keeps the deer away.

The final stop of the morning was in a natural stand of beech which had been thinned recently. Thirty-five trees/ha were removed. The average tree was 6.35 m³. Thinning is carried out every twelve years or so to coincide with a good seed year. Commercial lengths are used within Belgium to make furniture and staircases. The tops are sold locally for firewood. Natural regeneration is a cheap way to establish a beech plantation, the only cost being the thinning out. Protection from grazing animals is essential, either by hunting or fencing.

We had a very pleasant lunch stop at Forneau St. Michel. Here in the lovely

sunshine some of the party explored the museum, while others amused themselves in the childrens' play area! The museum buildings were collected from different parts of Belgium and re-erected. They represent the various styles to be found around Belgium.

After lunch, the President, Bill Wright, thanked Mr. Charue on behalf of the Society for a most interesting morning.

In the afternoon we visited the provincial property of Mirwart and were welcomed by head forester Mr. Crispiels.

This provincial estate was bought by the State in 1950, and covers 13,000 ha. Twelve thousand ha is forest, the remainder made up of amenity and fishing areas. Approximately half the forest is coniferous and half broadleaved. The management plan is to make a demonstration forest. A continuous



The final stop at Mirwart among the tallest Douglas fir in Belgium.



*Presentation of The Forests of Ireland to Baron Alain de Jamblin
by the President, Bill Wright.*

(Photo: D. Keane)

inventory is carried out and the forest is divided into twelve compartments, each with a separate management plan.

We first saw a pure stand of beech of mixed age. The standing volume was $240 \text{ m}^3/\text{ha}$. Natural regeneration is very prolific. Thinning of regenerated trees is carried out manually leaving about one tree/ m^2 .

Moving to the second stop brought us into a mixed forest of oak, beech and Norway spruce. Mr. Crispiels wants to keep this mixture. The spruce has a very good increment growing in mixture with the beech and oak. Back in 1900 the former owners made clearings in the beech and planted Norway spruce. The seed was of good provenance and very suited to the locality. These plantings were very successful. By the 1950's the Norway spruce has reached the same height as

the beech and both were treated the same. Presently, the Norway is being cut in patches. Regeneration of these areas is controlled to keep the mixture of beech, oak and Norway spruce. The standing volume is beech $55 \text{ m}^3/\text{ha}$, oak $66 \text{ m}^3/\text{ha}$ and Norway spruce $136 \text{ m}^3/\text{ha}$. Ground vegetation is ideal for regeneration with *Oxallis* and raspberry prominent.

Strict control of game in the establishment stage results in a successful forest. Later on game can be encouraged.

The final stop of the afternoon and that of the tour was to see a particularly fine stand of Douglas fir planted in 1901. In the early life of these trees, fire and game put a lot of pressure on its development. It is only since 1950 that the crop really came on. And how well it did develop. Presently, the crop is putting

on 20 m³/ha/annum. The dominant trees are 50 m tall and are among the tallest trees in Belgium. During 1985, a thinning was carried out where the average tree has a volume of 4.8 m³ and a height of 42 m. The remaining trees average 6 m³ (some individuals are 10 m³). The number of stems per hectare is 120 and volume/ha is over 1,000 m³. The stand is being retained for another twelve years or so as a source of seed.

What a magnificent stand, and a super place to end the Study Tour. These massive Douglas will be remembered for a long time by those of us fortunate enough to have seen them.

Bill Wright, thanked Mr. Crispiels for giving us his time to show us some truly fine stands of timber.

From here we drove north to Brussels where we were staying over-night. After the dinner, the President thanked most sincerely Baron Alain de Jamblin for his help in making the 1989 Study Tour such a success and presented him with a wooden bowl of evergreen oak (*Quercus ilex*) specially carved by Peter Sweetman for the 1989 Belgian Study Tour. He also thanked the Meetings Committee for their hard work with the organisation

of the tour.

A final thanks went to our driver Thomas Murphy. He did a great job. This was his fourth Study Tour and it was suggested that the Society should now make Thomas an honorary member!

Richard Jack

List of participants:

John Barrett, John Brady, Myles Cosgrave, Maureen Cosgrave, Michael Costello, Jim Cronin, Jim Crowley, Cuimin Fahy, Gerry Fleming, Mathias Fogarty, Lily Furlong, Frank Gibbons, John Greehy, Dick Griffin, George Hipwell, Dermot Houlihan, Jim Hurley, Richard Jack, Pat Kelleher, Denis Keane, Larry Kelly, Pat Kelly, Seamus Kennedy, Joe Kilbride, Edgar Lee, Jimmy Lehart, Eddie Lynagh, Gerard Mawn, Kevin McDonald, Michael McElroy, James McHugh, Con Nyhan, Michael O'Brien, Paddy O'Kelly, Tim O'Regan, Denis O'Sullivan, Tom Purcell, Joe Treacy, Ari van der Wel.

Convenors: Eugene Hendrick,
John Fennessy

President: Bill Wright

FOREST WALKS 1990 SERIES

Since European Conservation Year in 1970 the Society of Irish Foresters has organised a series of guided forest walks for members of the public who wish to learn about the value of our trees and forests. Many thousands have participated in these walks and have returned with a deeper understanding of the role forests play in the economic and aesthetic development of our country.

To coincide with Ireland's Presidency of the EC and "Earth Day 1990" the Society of Irish Foresters and Coillte Teo. are jointly organising a series of guided forest walks together with the Northern Ireland Forest Service. These walks are scheduled to be held on Sunday 22nd April commencing at 3.00 p.m. at a number of venues throughout Ireland.

John Fennessy