

# SOME ASPECTS OF GERMAN FORESTRY AS SEEN BY AN IRISHMAN

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ON the invitation of Forstmeister Scherer, of Wildeck, I paid a visit to West Germany in July, 1952.

In this paper I shall give some items of forestry interest culled from my diary of an unforgettably pleasant interlude.

It is only fitting that first of all I should record my gratitude to the Forstmeister who acted as my guide and companion during my fortnight's stay and to all the other busy men who gave me so generously of their time, knowledge and hospitality. I shall always cherish the memory of the warm welcomes, the great kindness and the many courtesies which they extended to me.

From Wildeck in Hessen we travelled southwards on the *autobahn* by "Volkswagon" car stopping at the State Experimental Nursery and Seed Extractory at Wolfgang, near Frankfurt-on-the-Main. There we were met by Forstmeister Dr. Messer, who very kindly showed us round.

This nursery, opened in 1928, has an area of 25 acres and a diluvial soil. A light railway is laid along all the main paths, the ground being level and hydrants are placed at suitable points to enable overhead irrigation to be carried out. Our visit coincided with a heat wave, the temperature in the soil a few days previously was 133° F., and many of the first year conifer seedlings, although shaded, showed effects of the extreme heat. In discussing sun-scorch Dr. Messer mentioned that he had found Douglas Fir to be less sensitive than Norway Spruce in all stages of its nursery life.

A striking feature was the breaks of *Populus robusta* raised from cuttings. First year plants were on an average five and a half feet high and second year plants nine feet. Second year plants of the class "1 on 2" (i.e., one year shoots on two year old roots, the plants having been cut to ground level after the first year, to encourage the production of straighter stems, and relined) were six and a half feet high. One reason for their remarkable size so early in the season, Dr. Messer explained, was that close by and in the direction from which the water flows to the nursery there is limestone rock. The water-table in the nursery is normally sixteen inches below the surface, and the calcium-charged water, so beneficial to Poplars, is freely available to the plants. In this sandy soil they found that cuttings take best if completely covered with the soil when being set.

We were then shown an example of the *Dunemann* system of raising seedlings. The results were not very impressive owing, as far as I could gather, to neglect of watering but as the system seemed to have been increasing in popularity in Germany where, in other nurseries, I saw some successful beds and as it may have possibilities in this country, I shall give an outline of the technique.

A frame is erected of normal seed bed width, any desired length, and about fifteen inches high. This is filled to a depth of about twelve inches with Spruce needles well packed and liberally watered. On the needles is sieved a layer of hardwood leaf-soil just sufficiently deep to form a smooth even surface, half a centimetre (about one fifth of an inch) is considered the optimum depth. When the seeds are sown on this and pressed into the mould they are covered to a suitable depth with the same material. The bed is then shaded, the conventional laths or tree branches being suitable. Except during wet spells watering through a fine rose must be carried out each evening.

On germinating the seedlings absorb the plant food being released by the rotting of the Spruce leaves and the heat rising from the decaying mass has the effect of prolonging the growing season, resulting in bigger seedlings. In addition it is claimed that the unrestricted movement of the roots through the compost results in the seedlings being furnished with an abundance of fine feeder roots and for this reason a much denser stocking than normal is possible. Another advantage claimed is that the necessity for weeding is entirely obviated. This last point is of major importance in the economics of nursery work in this country although in recent years considerable relief has been provided by the use of White spirit and Vapourising Oil sprays on pre-emergence weed growth. I didn't hear of any damping-off fungi having attacked the seedlings but every nurseryman is aware that leaf-soil can be a very fruitful source of these. Even if sterilized the danger of introducing spores in the frequent watering is quite real as many with experience of mushroom-growing know. Normally seedlings are lifted after one year although they can be allowed to stand for two years if required. When the seedlings are lifted the compost can be used to advantage as a mulch through transplant lines.

Although Douglas Fir was the only species I saw tried under this system there seems no reason why it would not be suitable for raising any of the common conifers or hardwoods.

The system seems to be worth a trial here with a view to making comparisons between the cost and quality of the seedlings raised by this and the conventional systems. It should be a useful method for the land-owner who would like to sow his own tree seeds, but who is hampered through not having any ground inoculated with the necessary mycorrhizae.

We next inspected some plants of Scots Pine and European Larch on which were grafted scions of plus trees of those species for the purpose of forming a seed orchard. All plants were in pots and the grafting had been done in Spring in the glass house. Under glass the temperature and humidity can be controlled and in this manner at Wolfgang a take of 90 per cent. in Pine and 68 per cent. in Larch had been achieved.

Having left the nursery we were shown through the seed extractory. Established in 1826 this is claimed to be the biggest and best equipped plant in Germany.

The cones, on arrival, are whisked by electric elevator to the top of the storage building where the different provenances are kept in separate compartments. Air drying takes place here, the sides of the building being open. When considered sufficiently dry for storage a trap door in the compartment is opened and the cones are let down by chute to the storage accommodation on either of the two floors beneath. On these floors the dry cones are stored to a depth of one metre. From this building they are again conveyed by elevator to the top of the extraction house. From there they move downwards through four different stages, the temperature, which is thermostatically controlled, increasing at each stage. At the first it is  $77^{\circ}$  -  $95^{\circ}$ , at the next  $95^{\circ}$  -  $104^{\circ}$ , at the next  $104^{\circ}$  -  $113^{\circ}$  and finally at  $113^{\circ}$  -  $122^{\circ}$  F. The cones are in constant movement in rotating drums and by means of the combination of this movement and the heat, even refractory cones such as those of European Larch can be broken down. For de-winging, the seeds are placed in a long narrow trough which is fitted with an electrically driven spindle which runs through the length of the trough and to which are fitted wooden pegs radially arranged at frequent intervals. When, by this means, the wings are separated from the seed and broken down, the resultant dust is sucked out through a duct. A high moisture content in stored seeds has an adverse effect on their viability and therefore the moisture content of all conifer seeds is reduced to 6 per cent. before they are placed in storage.

The seeds are stored in glass jars in a cellar which is fitted with electric air-conditioning equipment and in which the temperature is maintained the year round at  $4^{\circ}$  -  $6^{\circ}$  C ( $39^{\circ}$  -  $42^{\circ}$  F.).

Travelling down to Heidelberg along the beautiful Neckar Valley we passed some examples of devastated woodland. Actually such scars were surprisingly few in the part of Germany I visited. It would appear that much of the felling done to meet post-war demands was in the nature of heavy thinnings—barbarous treatment admittedly in the eyes of a forester of the orthodox German School who favours such dense stocking but, in the eyes of those who favour the other extreme, the treatment might be regarded as having been indeed necessary!

Up at the Königstuhl, highest point overlooking the town of Heidelberg and 563 metres (1,829 feet) over sea level we inspected excellent crops of Norway Spruce. The annual rainfall here is 34 inches,\* 18.5 of which falls during the six months March to August inclusive, July having the highest monthly temperature of  $60.5^{\circ}$  F.

This crop contrasted with the Norway Spruce one can imagine growing at a similar elevation here brought home the difference between the effects of the Continental climate which prevails there and the insular climate which is ours.

\*All climatological data in this paper is taken from "Fremländische Wald—und Parkbäume" by C. A. Schenck, Berlin. 1939.

After a pleasant interlude in Heidelberg we travelled north to the Forest District of Weinheim. There we had as guide Forstmeister W. Fabricius, who spared no pains to make our visit interesting and enjoyable.

In the Weinheim Forest District which includes the estate of the Count von Berckheim there are upwards of eighty exotic species up to 85 years old. There an Irish forester will rub his eyes when he sees young plantations of such species as *Cercidiphyllum japonicum*, *Magnolia Kobus* and *Magnolia tripetala* all growing vigorously and nursed by Beech and Maple with which they seemed to have no difficulty in holding their own.

Outstanding, however, in respect of volume production were some conifers from Western North America. We inspected eighty-five year old plots containing *Abies concolor* var. *Lowiana* up to 156 feet total height, green coastal Douglas Fir (*Pseudotsuga taxifolia*) 150 feet and *Abies grandis* 134 feet. The last mentioned became stag-headed at 80 years and no further height growth or seed production took place. A seventy-five year old plot of Incense Cedar (*Libocedrus decurrens*) and an eighty year old plot of Western Red Cedar (*Thuja plicata*) were also very successful, having average heights of 80 feet and 85 feet respectively. The latter had produced an abundant crop of self sown seedlings quite a distance from the parent stand. An eighty-five year old plot of Sugar Pine (*Pinus Lambertiana*) was almost completely wiped out by *Cronartium ribicula* which had spread from orchards of *ribes* in the immediate vicinity. *Pinus ponderosa* had grown reasonably well, an eighty year old plot having an average height of 65 feet. The pride and joy of the Forstmeister, however, is the stand of eighty-five year old *Sequoia gigantea* containing 230 stems, the highest being 140 feet and the true volume per acre being 14,967 cubic feet. For comparison Norway Spruce of the same age and on a site of similar quality, yields, according to Schwappach, 8,719 cubic feet.

All the plots mentioned are on the estate of the Count von Berckheim where the elevation ranges between 440 and 820 feet, the soil is sandy and the ground rock granite, except for a small area of limestone. The annual rainfall is 27 in., the area is subject to occasional late frosts and, often in April, wet snow. May is very dry and growth continues late into Autumn. Dahlias are often in bloom in the garden at the beginning of December.

From Weinheim we travelled north to Frankfurt where we were met by Frau Dr. Keil and Forstmeister Preiss who showed us over the newly planted pinetum attached to the Frankfurt community forest. The range of species in the pinetum was wide and planting was carried out through shade trees which were reserved in the process of site preparation. We were also shown an arboretum in which were many East American broad leaved species.

Next item of forestry interest was a visit to the Meissner mountain, one of the most picturesque and romantic places in Northern Hessen. It has a rich flora and some very interesting forest crops. We were shown through the district by Forstmeister Von Trott who drove us over the sharp gradients in his "Mercedes" car, powered by a Diesel engine.

The geological formation of the foothills is sandstone while that of the upper slopes and plateau is basalt. On some of the sandstone areas we inspected work done on the conversion of blocks of pure Spruce, legacy of the days when monoculture was widely practised in Germany, to mixed stands. Very briefly the process is thus : small openings are made during years of good seed crops and patches 10 - 15 feet in diameter, suitable for the germination and growth of seedlings, are prepared by mixing the soil and humus. Surplus seedlings in some patches are transplanted to others where regeneration is not so successful. After further gradual opening out the resulting groups of young Spruce are linked by planting Beech, Oak and Douglas Fir. On moving into the basalt area we inspected some very striking three-storey crops of Beech. In what had been a mixed hardwood stand we saw where, after the usual regeneration fellings, there had been a good crop of Beech, Ash and Norway Maple seedlings. Clear felling was carried out in what was regarded as due time but which, however, proved to have been too early as the Beech was not quite advanced enough to compete with the vegetation that sprang up. The Ash and Maple, however, being better equipped to endure smothering herbaceous growth came away vigorously. It is the intention now to interplant these with large Beech and European Larch.

An important part of the work on Von Trott's domain is the treatment by means of *Dauerwald*† of approximately 300 hectares (740 acres) of mixed crops of Beech, Maple and Ash. He explained that the process is a tricky one and that not the least of his difficulties is to prevent the disappearance of Beech from the young crop. Some factors militating against Beech are its infrequent fruiting as compared with the frequent and abundant fruiting of Ash and Maple and also the fact that its seeds do not lend themselves to dispersal over such wide areas by natural means as do those of the other two species. Furthermore on southern and southwestern exposures young Beech cannot survive if the canopy is more than 60 per cent. closed. (In the northern and northeastern exposures where conditions are more suitable it can stand more shade).

On descending the mountain by a circuitous route we came across some very good specimens of fifty-eight year old Douglas Fir and *Thuja plicata* which indicated the possibilities of those species there, possibilities which are, in fact, recognised by the Forstmeister who includes some in much of his plantings.

From this charming and interesting countryside we travelled northwards to Hannoversch-Münden where we visited the Forestry Faculty of the University of Göttingen, *alma mater* of my friend Forstmeister

†The term *Dauerwald* embraces all silvicultural systems which do not involve clear cutting or exposure of the soil.

Scherer. There we were met by Professor Dr. Schmucker who showed us over the botanic gardens and nurseries attached to the Faculty. We inspected some work on controlled pollination of Birches. There were lines of plants derived from crosses of *Betula pendula* (*verrucosa*) X *B. papyrifera*, *B. pendula* X *B. ermanni*, and *B. pendula* X *B. maximowicziana* all of which displayed *heterosis* (hybrid vigour) but this was most pronounced in the progeny of the first mentioned cross. In inspecting work on the grafting of Pines, Spruces and Larches for seed orchards we saw where a student had tried grafting Scots Pine on Norway Spruce and *vice versa*, both successfully. Having taken us through the botanic gardens the Professor showed us his rich collection of dried specimens and in conducting us through the Faculty building showed us a new wing built by contributions from timber merchants.

It was unfortunate that Professor Dr. Wittich, Director of Soil Science of the Faculty‡ was absent due to illness but we were lucky in having Dr. Themnitz to tell us something of the latest developments in that field. We were shown soil profiles which illustrated very well the different stages of the podsolisation of Loess (a fine fertile loam, yellowish brown in colour, of which there are extensive deposits in Germany and which is believed to have been transported to its present situation by the wind). In discussing soil amelioration Dr. Themnitz told us that by the application of lime to Spruce crops over forty years old, thereby activating the raw humus, increment was increased by as much as 45 cubic feet per acre. The rate of application depends on the depth of the humus layer, the composition of the soil and its pH value but quantities up to four tons of burnt lime per acre may be necessary. This should not be applied all at once, however, as among other possible harmful effects from such a dosage, earthworms may be killed, but over a period of 5 to 10 years. The recommended minimum quantity at any one application is 22 cwt. per acre. It is important that burnt lime be mixed with the soil immediately it is distributed.

In reference to the amelioration work in clear felled areas, the soils of which have been degraded by successive crops of pure Spruce we were told of the system known as *Waldfeldbau*, a very old system and for long out of fashion but which has been revived in some parts of Germany during the past 10 or 15 years. This involves intensive cultivation of the soil, which necessitates the removal of the stumps, thereby mixing the impoverished and enriched layers and improving drainage. This is followed by liming and manuring. One or two grain crops may then be taken from the ground and again at the time of the direct sowing of the tree seed a further crop is sown, usually buck wheat, rye or oats. This crop shelters the young trees and can be cut just above them without causing damage. Being isolated these grain crops command a high price for pure seed purposes when special strains are grown, as is almost always the case. A few years later perennial lupins are sown between the rows of trees for the purpose of increasing the nitrogen content of

‡See "Irish Forestry," Vol. VI, Nos. 1 and 2, 1949, for an article by Dr. Wittich on "The Possibility of Afforesting Soils of the old Red Sandstone in Ireland."

the soil by their nodule bacteria and of suppressing undesirable vegetation. It is claimed that the return from the sale of the stumps for fuel, and of the cereal crops together with the increased yield from the succeeding tree crops more than pays the cost of the intensive soil preparation.

The same intensive cultivation is carried out in afforesting heathland and other wasteland types, as (1) it is claimed it pays and (2) naturally, owing to the absence of the tree stumps, the work can then be done so much more cheaply than is possible later when a tree crop is established. Furthermore, and this is closely related to (1) these methods result in the possibility of a much wider range of species, and mixtures which not only can maintain the fertility of the soil but improve it.

The adoption of such methods in Germany can be readily understood as, owing to their happy position, 28 per cent. of their land surface is under forests—the Germans are not in a desperate hurry to plant up land. Indeed in almost all cases they have reached the limit in regard to the acquisition of land for forestry purposes and it only remains for them to produce the maximum from the ground they already have.

From Hannoversch-Münden we travelled westwards through the famous Reinhardt-Wald, home of some of Germany's finest Beeches, to Rhoden. There we visited a special type of work-instruction centre. We were met by Forstmeister Backhaus, the Instructor-in-Charge, who told us that the centre was established for the purpose of giving intensive practical courses on felling and extraction, planting and road construction to forestry students, and refresher courses on these subjects to Foremen, Foresters and Forstmeisters.

Instructions are given in great detail on the best type of tool for use at the various operations, e.g., in the case of the axe: the material suitable for the handle, *Acer montana* is preferred to Hickory or Ash; the shape of the handle, the weight of it—the same length as the arm of the user—the shape of the axe and the weight of it. This last is always a matter of surprise to an Irish Forester who is accustomed to 5 and 6 lbs. axes—the Germans will not use an axe one gram over 2½ lbs. I was assured that the decision to use this light axe exclusively was taken only after years of research. It was found that its use over any given period resulted in a higher output by and less fatigue to the workman than if a heavier axe were used. Investigations of this nature have been carried out in respect of all tools and equipment used in the forest. Those attending the course are instructed in the proper use of all tools, methods of sharpening them and their general maintenance. I noticed that the edges of all axes when not in actual use are protected by sheaths ingeniously made from wood or leather. Attention is also given to the time taken to carry out various operations which information necessary in arriving at peace-time rates, is ascertained with the aid of a stop watch.

At the time of our visit there were 30 students in residence at the



centre and the staff consisted of the Forstmeister who was also District Officer, four Forester-Instructors part-time, a housemaster, a matron and four maids.

From this place we returned to the point from which we started—Wildeck (see article, "German Forestry To-day" in *Irish Forestry* Vol. VI., Nos. 1 and 2, Winter, 1949).

This was a haven of rest after our somewhat hectic tour and our quiet drives through the magnificent old woods in a hunting carriage drawn by a pair of horses was in sharp contrast to travelling on the *autobahn* where the normal speed is around 70 miles per hour.

In the 5,000 or so acres comprising Wildeck *Forstamt* we inspected examples of some silvicultural systems, an aspect of Forestry which, above all, is the German Forester's forte. Particularly successful was the *Blenderscaumschlag*, (a variation of the Shelterwood Strip System) applied to Norway Spruce. The Forstmeister told me that this system did not, however, suit Beech as, owing to the long intervals between the seed years and the limited distance over which the seeds are dispersed it would take a lifetime to regenerate a small area. In Wildeck the system is not suitable for Scots Pine either, as regeneration on the North side is severely attacked by leaf shedding diseases owing to the dampness and where they escape disease they are more attractive to slugs, insects, deer, hares, etc., being soft and succulent due to the partial shade. Of special interest for me was a Beech wood in compartment 40 where, as a student in 1938, I assisted in marking the trees to be removed in the first regeneration felling in accordance with the *Schirmschlagbetrieb* (Uniform System). Since that time many regeneration fellings have been carried out, the clear felling having been done in the Winter of 1951. Regeneration was good—plentiful and vigorous. European Larch was planted through it here and there in the Spring of 1952, not so much to fill up thin patches as there did not appear to be any, but rather that a silviculturally sound and economically desirable mixture be formed.

Vigorous natural regeneration particularly of Scots Pine and European Larch was to be seen in many of the less fertile areas through the old woods particularly in fertility classes 3 and 4 (five fertility-classes are recognised in German Forestry). In the more fertile areas natural reproduction is not so successful owing to the smothering effects of the lush vegetation and direct sowing of seeds or planting, following cultivation are the methods employed. The normal espacement used for planting one year old Scots Pine, which is the recognised age for planting out that species, calls for 23,000 to 30,000 seedlings per hectare (9,000 to 12,000 per acre). This is considered necessary for the production of high quality timber, as the close spacing ensures fine branching and consequently small knots. Only the final crop trees are pruned and in the case of these the fine branching makes for quicker occlusion of the pruning wounds and lower pruning costs.



Planting costs, too, are low due to the intensive cultivation and one year seedlings are cheap. Naturally no beeting is necessary. Heavy stocking right through to the end of the rotation is the accepted method as dense slowly grown timber of the highest quality with narrow annual rings is the aim.

In the case of Norway Spruce three to four year old transplants are used and the normal espacement is 1.50 to 1.70 metres. European Larch is planted at much the same distances as Spruce and normally two year seedlings are used.

In these German forests one looks in vain for Sitka Spruce and *Pinus contorta* both of which figure so prominently in Irish plantations but with, for instance in Hessen, a rainfall of 24-30 inches and an atmosphere of low humidity, conditions are too dry for Sitka Spruce and, with the soil preparation methods practised, more commercially valuable species than *Pinus contorta* can be grown.

One looks in vain for rabbits also.

I haven't mentioned the very enjoyable and instructive visits which we paid to some commercial nurseries, viz., that of Conrad Appel of Darmstadt, Gust Ludemann of Frankfurt, the branch nursery of Messrs. Pein and Pein near Kolenz and the branch nursery of Willi Emmerich at Celle near Hanover. To the proprietors of all of these my best thanks are due for the facilities so readily afforded me to study their nursery technique and systems of management.

