

IRISH FORESTRY

Journal of the Society of Irish Foresters

Published Twice Yearly



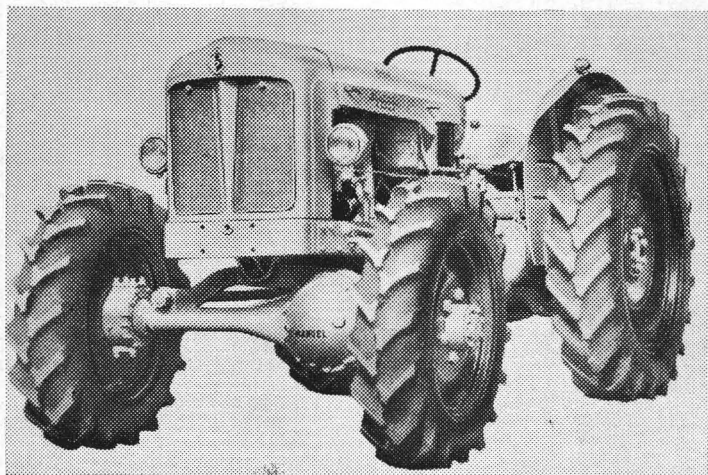
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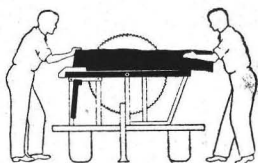
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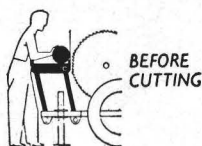
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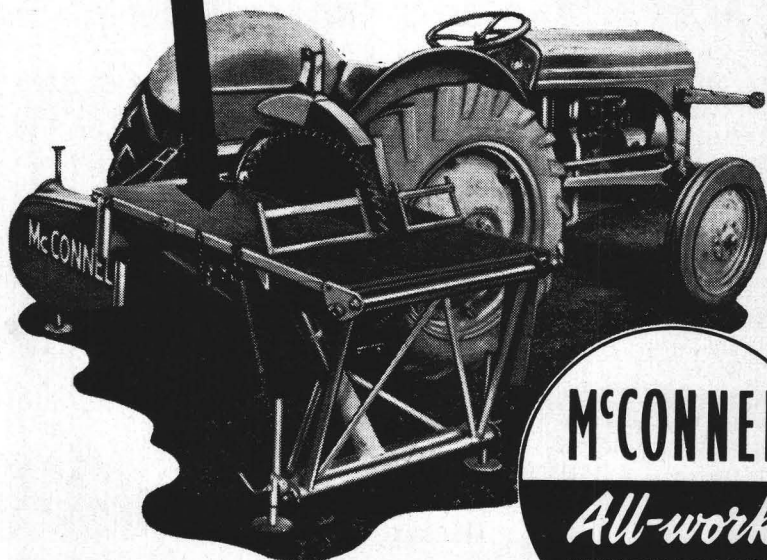
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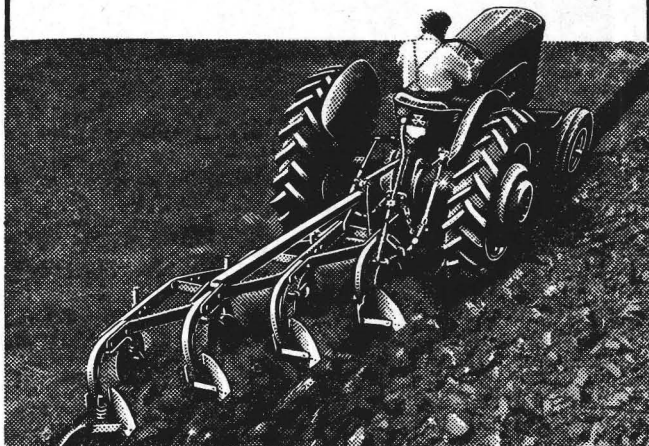
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(Excerpted from the Constitution)

Article V.—The membership of the Society shall consist of two Orders, namely: Technical and Associate.

TECHNICAL MEMBERS shall be persons desirous of promoting the object and at the time of election resident in Éire, who are employed for their whole time in forestry or any branch of natural science closely connected with forestry, or who have been so employed for at least five years, or who, though not so employed hold a degree or diploma in forestry of a recognised University or College, in all cases subject to the approval of the Council.

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Members shall subscribe annually to the Society's funds according to the following scale of subscriptions:—

Technical Members, Grade 1, shall pay	...	...	£1	0	0
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IRISH FORESTRY

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Vice-President:

M. SWAN, 17, Landscape Crescent, Churchtown, Dublin.

Secretary and Treasurer:

T. CLEAR, Albert Agricultural College, Glasnevin, Dublin.

Editor:

J. J. DEASY, 11, Templeville Estate, Templeogue, Dublin.

Business Editor:

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IRISH FORESTRY

 Volume XV.

1958.

 Numbers 1 & 2

Editorial.

THE announcement in the Dáil last May by the Minister for Lands, Mr. Erskine Childers, that the Government had increased the grant for private planting from £10 to £20 per acre was received in forestry circles with great satisfaction.

While nobody who is acquainted with the problems of state afforestation is stinting in his praise of the great strides made by the Forestry Division, particularly in recent years, there are many who feel that it would be desirable both socially and economically if a much greater share of the work of building the nation's forests were assumed by the private land owner.

In every country in Western Europe the proportion of the forest area owned privately is much greater than that owned by the state. Denmark, a country which always affords us standards for comparison, since it is, like our own, mainly agricultural and composed of small holdings, has only 23% of its forests in the hands of the state. In this country the state owns 75% and before the recent announcement on private forestry it looked as if that proportion would continue to increase rapidly.

The backward position of private forestry in this country is regrettable. Ever since the 1880's it has been losing ground. One result of the breaking up of the estate woodlands on the passing of ownership from landlord to tenant was the clearance of large areas of forests. Statistics show that the area dropped from 340,000 acres in 1881 to 280,000 acres in 1921 of which 240,000 acres were in the 26 counties. As a result of further clearing and, also, the acquisition by the state of 85,000 acres of woodland the area of private forests in the Republic is now 90,000 acres only.

The grant of £10 per acre for private planting which has been available since 1946 did not prove sufficiently attractive as can be seen from the fact that in the last nine years planting under this scheme averaged a mere 350 acres *per annum*.

To the average Irish farmer, who needs all his available cash for developing and modernising his agriculture, forestry, if he thinks of it at all, is an undertaking which makes demands on capital and which gives no direct financial return during the early years of a plantation.

With notable exceptions the Irish farmer, in common with farmers in many other countries, lacks a knowledge of the rudiments of the

science and practice of silviculture and has little appreciation of the benefits to be derived from a carefully-tended plantation on his holding.

The increased grant will go far in solving the difficulties in regard to the availability of capital and we are glad to note that the Minister has announced his intention of launching a campaign of promotion of the idea of private forestry and of spreading a knowledge of the techniques of forest establishment and management by means of lectures and advisory inspections by competent forest officers and by the distribution of forestry literature.

This advisory and educational work is, of course, of the highest importance as the success of the scheme will depend not merely on the careful planting of an area with the correct species but on the proper care and maintenance of the plantation all through its life as well.

The case for private forestry is a good one. The aim in furthering it is to use the waste land of the country to the best advantage.

Elsewhere in this journal we publish a summary of a recent talk on the subject by the Minister for Lands which gives his arguments for private forestry as well as his plans for increasing the area under forests in private hands.

We congratulate the Minister on such a substantial increase in the planting grant and we assure him of our utmost co-operation in his efforts to convert the waste lands on the farms of Ireland into productive forest.

The Journal.

For many years it has been the practice to publish a summer and a winter issue of "Irish Forestry". Some difficulties have been experienced in getting the numbers out on time due to holidays intervening and to pressure on the printers around the Christmas period. This has resulted in number 2 of each year's volume appearing in a different year from number 1. There was another disadvantage in that the summer number was published at a time when many members were on holidays or busily preparing for them.

The Council have decided, therefore, to publish future issues in Spring and Autumn each year and to effect the change-over this issue comprises numbers 1 and 2 for 1958.

Machinery Notes.

In this issue we publish a note concerning a new chain saw. In future issues it is proposed to devote some space to any new forest machinery that would be considered to be of interest to members.

List of Members.

In accordance with the policy of the Society that the roll of members should occasionally be published in the journal a complete list of the names and addresses is given in this issue. The list was last published in June 1955.

Mr. Childers on Private Forestry.

MR. ERSKINE CHILDERS, T.D., Minister for Lands, speaking on private forestry at Muintir na Tíre Rural Week in Roscrea on Thursday, August 14th last said:—

The Government's decision to increase the grant for private forestry from £10 to £20 an acre is in some ways of less significance than the decision to undertake a promotion campaign and for this purpose to invite the co-operation of the existing forestry societies and rural organisations.

Mr. Childers said—

"I ask for the help of Muintir na Tíre in securing a massive increase in the level of private planting of trees, on the following grounds:—"

1. We have for too long considered national policy on a short-term basis. An agricultural country should think of development over twenty to fifty years and should prepare for every eventuality. The Government of the day should seek the collaboration of organisations like Muintir na Tíre if their rural policies are to succeed.

An increase of private afforestation will be a sure sign that the dynamic attitude to production so much approved by Muintir na Tíre is coming at long last.

2. There are tens of thousands of medium sized and larger farms where land is not scarce. Attached to many small farms is an area of useless cutaway bog or moor.

3. There are thousands of blocs of privately-owned land, from half an acre upwards, suitable for planting, producing little or nothing at present.

4. For the first time the Department of Lands is being charged with the duty of promoting private forestry as being of equal importance to State afforestation. Up to now the rural community have not been told parish-by-parish the value of trees as an investment. It has never been adequately emphasised that trees properly planted and reasonably maintained are a magnificent investment— as safe as any gilt-edged investment or bank deposit and that of all the products from the land the increase in world demand for timber products, according to every international economic organisation, seems to be the most certain and to be almost perpetual—world catastrophe excluded.

5. The basis of the private forestry campaign is the human appeal to every farmer with some land which produces little or nothing, to invest in a dowry for his son amounting to £300 or £400 per acre and a dowry for his grandson of another £700 per acre at a very small initial cost.

6. Private forestry can extend existing employment, create new employment and provide work for men in periods of the year when their retention may not otherwise be wholly remunerative.

For the farmer who does the work himself the additional burden involved in maintenance is not considerable.

7. Private forestry must increase as a result of personal decision by the rural community and the assistance of Muintir na Tíre will be of immense value to us.

We hear many appeals for increased production. In the matter of growing timber there is a most obvious case for increasing production. The markets are available and the nearest is Great Britain where there will never be more than 35% self sufficiency.

The United States is, almost incredibly, a net importer of wood products. Europe too, is becoming a net importer. Consumption will continue to rise.

The present net importation of timber products to this country is worth £10 millions a year. The vast bulk of the material imported could be produced at home.

8. The yield from Irish timber is high by world comparison and our climate is most favourable to rapid growth.

9. The initial outlay on planting varies according to the extent of preparatory work required. It is certain, however, that the increased grant will go a long way towards meeting the cost. Indeed, in many cases where the work can be integrated with normal farm work in the winter months without extra labour costs, or where the land is in a fairly clean condition the grant should cover almost all the expenditure involved.

The increased grant of £20 an acre now available to private planters is a genuine inducement and I feel sure that I can count on the assistance of Muintir na Tíre and other rural organisations in the campaign which my Department is about to launch. The campaign will be commenced in Wexford and Kilkenny, counties where Muintir na Tíre has many branches but advice is available free in all counties.

NOTICE TO MEMBERS

Members are reminded that there is an arrangement with the Irish Central Library for Students for the lending of books relating to forestry to members of the Society.

Borrowers are limited to three books at a time and are permitted to retain the books for a maximum period of six weeks.

All applications should be sent to the Secretary who will forward them to the Librarian.

Acknowledgement

Our cover photograph is published by kind permission of the Department of Lands (Forestry Division).

Danish and Irish Forestry Compared.

Paper read by DR. AXEL S. SABROE at the annual general meeting of
The Society of Irish Foresters.

Dublin, March 15th, 1958.

Mr. Chairman, Gentlemen,

To-day when I, according to the honourable invitation, am going to speak about "Danish and Irish Forestry Compared" it is with great pleasure but also with considerable hesitation.

First, it is difficult to express oneself in a foreign language—and I beg you to bear with my pronunciation.

Second, it is difficult to speak about Irish forests. Two years ago I had the fortune to see a few of your forests and you cannot make yourself familiar with the local conditions in a few days, but, as a Danish playwright (Kaj Munk) wrote: "Facts distract" so I do hope that my opinions will not offend you, and I shall be very pleased if you will correct me.

DENMARK.

Landscape.

The Danish landscape is in most places hilly or undulating, the highest point, 568 feet above sea level, being in Mid-Jutland. The western parts of Jutland are partly large flats dating from the last ice age. Other flats do occur in the south-eastern parts of the islands. On the west coast there are dunes, which also may be found on the coasts of some islands. Only the island of Bornholm in the Baltic has rocks. In the rest of the country the substratum under the moraines from the ice age is limestone, and in some places it forms cliffs near the coast.

Soil.

The soil changes from very heavy clay in the eastern part of Seeland, the S.E. islands and some parts of East-Jutland to very poor sand with heavy hard pan in the heath. For the greater part the forests stand on clay that was too stiff for the farmers in former times, or on sand that was too poor. In the old forests the underlying lime helps to better the conditions, especially for the beech forests.

Climate.

In your country as well as in mine the climate is the never-ending topic. The average weather does not seem to occur outside the meteorological stations.

It seems to me, according to the few observations from Irish stations I have been able to get, that your summer temperatures are not much higher than the Danish ones, but your winters are not nearly so cold as ours.

Our yearly average is about 46° F. and the average in the growing season, May-September, is 57.5° F.

Generally the winters are unusual. For instance in January of 1957 the weather was very mild, there was sap in the beeches and later we had frost and snow. This winter we have, suddenly, several times had as low a temperature as -4° F. in between temperatures of 50° F. Now and then we have strong frost without any snow, and if the sun is shining at the same time, it may be difficult for the conifers to get their water supply.

In springtime we may have severe night-frosts, as a matter of fact night-frost can occur in any month in the middle parts of Jutland. Consequently a lot of damage can be done especially to young beech, ash, silver fir and Sitka spruce.

The summers also change greatly. Some years the saying is, that we had summer on a Thursday, in other years we may have a prolonged period of heat. But we do not have such a tropical heat as I experienced in Kerry in June 1956—when my wife during the same days felt rather cold in Northern Ireland. However, I was told that such a heat was not usual for Ireland, so I do not think that it is wrong to state that both countries generally have an unusual climate. But I am sure that yours is the more advantageous.

The mean precipitation in Denmark is 25 inches, varying on an average from more than 30 inches in parts of Middle-Jutland to 18 inches on the coast of the Great-Belt. But it changes from year to year just as the temperature.

The Forests.

I shall not bother you with a lot of statistics but just mention a few facts.

Although Eire is 60% bigger than Denmark, we have 40% more inhabitants than you have, and we have four times more forests than Eire.

Of course, I know, you are rapidly building up your forests, just as we have been doing during the last 100 years, doubling our forest area, mostly in the heaths but also on farmland belonging to the big estates.

The State forests proper comprise about 23%, the Dune Service (also belonging to the State, but with a separate administration) 11%, public foundations and municipalities 10%. The Heath Society owns 3% (but administers 10 times more). The rest, 53%, are private forests of which one-third are estates with less than 600 acres, and not less than 26% of the area of all forests in Denmark belong to properties less than 125 acres.

Of all forest estates of over 125 acres about 41% are covered with hardwoods (28% of which is beech) and 59% with conifers (spruce and silver fir dominating with 34%).

However, it must be mentioned that the hardwoods cover 60-80% of the forest area on the islands.

For *beech* the age classes are almost normal from 1 to 120 years of age, but of conifers few stands—only 10%—are over 60 years old.

All Danish forests—including the heath plantations planted with subsidy from the state—are, since 1805, subject to protection by law, stating that they shall continue as forests, must not be cut down without proportional regeneration, and that the felling of wood for sale in newly purchased areas must not be done, for the first 10 years, unless sanctioned by the government.

The quality of the *beech* is generally not so good as we would wish, but during the two wars a lot of poor beech areas were regenerated with plants of better origin. Intensive thinnings are also gradually improving the stands, as the "wolf-trees" are now cut at an early stage.

Furthermore, the quality class seems to have been improved by way of altering raw humus ("Mor") to good mull. I have just been studying the improvement in my own district. For the age class 20-40 years the quality class has been improved by one between 1875 and 1948, and for the age class over 120 years it has been improved by more than one-and-a-half in the same period. When comparing the years 1933 and 1948 it can be seen that the stands are still going strong in the good direction.

Natural regeneration is used in the best stands and on the best soil, but generally "artificial" regeneration with seeds or plants from seeds collected in our very best approved stands are used. Eight thousand plants per acre is now the average number, and the cost may rise as high as £80 per acre—a price some of us think is a little too high, even if it is reasonable to let the old stand pay for its successor.

In former times it was customary to give much light to regeneration, natural as well as artificial. The result was competition between the old trees and the plants, and the latter died of thirst. Now the opening up is generally done more slowly and overwoods are gradually felled so that some are retained 20-30 years. In this way we are able to keep the soil in good condition and root competition does not occur. At the same time we are "educating" the young trees in a half-shade, whereby the form is becoming better and the surrounding stands are not suddenly exposed to wind and sun damage. Also a valuable increment is obtained on the overtrees.

The beech forests give an additional element to the Danish landscape, so that the beech is accounted our national tree, even if the Northern boundary is going a little North of Denmark. I think, the reason is, that we have high forest of beech growing on the sides of fjords and right along the sea, a combination which is probably exceptional throughout the whole world. As stated in one of our national songs: "Denmark shall endure as long as the beech mirrors its top in the blue waves".

The oaks—mostly common oak—has been planted or sown on a big scale since about 1890, mostly on stiff clay. Some old stands can be

seen, among them probably the oldest sample plot in the world watched and measured since 1826.

The other hardwoods cover mostly smaller areas. The ash is dominant mostly in small hollows in beech-woods. But during later years an increasing interest in the *sycamore maple* is developing, and our Forest Society has just published a book about this tree (with a resumé in English). I, for one, make use of this fine tree on a rather large scale, as it is valuable and improves the soil conditions.

Norway spruce is the dominant conifer. The net-result is big, as there is a great market for the timber and also the small dimensions. The butt-rot fungus (*Fomes annosus*), however, is doing considerable damage to the stands, and on good soil they generally have to be regenerated at an age of 35-40 years. We do not know any certain means to keep the fungus in check, but, it is a fact that spruces standing among the beeches can remain sound up to 100 years or more (a few of the oldest are 190 years). Personally, I think, that mixing spruce and beech would be the right solution on good soil, but it cannot be done in the heath plantations, where the fungus also damages the stands, even if it is in a lesser degree than on good soil.

The *silver fir* was planted far and wide in the beginning of this century, when the spruce stands became rotten. But then the silver fir was attacked by the aphid (*Chermes piceae*), and cultivation was mostly given up. According to my opinion, the reason was that the silver fir was planted on beech raw-humus and in regions with a precipitation considerably below the required 28 inches. At present the cultivation is taken up again, even in the heaths. And in my district, we have very good results from natural regenerations mixed with beeches. The lesson shows, that you have to be careful not to follow the "modes" uncritically. Another fir, *Abies Nordmanniana* has been used with success and give, together with noble fir (*Abies nobilis*), a big net-profit, when Xmas-decoration twigs are sold.

The *mountain pine* has been valuable in the heath. When mixed in the spruce cultivations it helps the spruce through critical periods. But, also a pure stand—even if giving only firewood—is a benefit, as spruce planted under 30 years old mountain pine in another 30 years may reach the same height as a 60 years old spruce stand planted pure on heath.

The *Scots pine* can only be used in parts where the precipitation is very low. Therefore, it should be interesting to try some seeds from the native pines in Kerry.

Contorta pine is used very little, mostly as nurses.

Douglas fir and *Sitka spruce* have been used to a great extent. But between the wars, we got the wrong provenance of Douglas seeds, collected too far inland in British Columbia. The result was attacks from fungi, *Rhabdocline* and later, *Phaeocryptopus*. Furthermore the

Sitka spruce was badly attacked by the barkbeetle, *Hylesinus micans*, mostly after the dry year in 1947.

Japanese larch has a fine growth and has been tried in the heaths too, but the dry years, mostly 1955, unfortunately did a lot of damage there.

Many other exotics such as *Western red-cedar* (*Thuja plicata*), *Western hemlock* (*Tsuga heterophylla*) and *White-cedar* (*Chamaecyparis lawsoniana*) have been used to some extent.

All conifers in Denmark are exotics. Only the juniper in the heath is native.

Heath plantations.

About 1790 the State had commenced experiments with trees in the heaths of Jutland but they met great difficulties. The reason was partly that sowing was used without proper preparation of the soil, and partly that Scots pine could not stand the humidity of the air. Some spruce stands did gradually grow up, but it was not till after the year 1866, when *The Danish Heath Society* was founded by E. M. Dalgas, an Officer of the engineers, that it became a success. The main reason was that we got the Hanoverian trench plough, which could break the hard-pan, and that the *mountain pine* was introduced. The object of the Society was firstly to promote a more rational cultivation of the farms on the heath by marling, irrigating of meadows, regulating of water courses, shelterbelt planting, etc. Secondly, it was to help making plantations. The Society was intended to act in an advisory capacity only, but little by little they have acquired some plantations of their own. The funds came partly from the members, but the State has added considerable amounts too. From the State is also paid $\frac{1}{3}$ - $\frac{1}{4}$ of the cultivation expenses for new plantations but these plantations must be under the forest law, which means, that they must remain as forests. The Society has helped to plant about $\frac{1}{4}$ million acres, of which $\frac{1}{3}$ is continually administered by it.

During the same period the State plantations on the heath and on the dunes developed as well.

At first only Norway spruce and mountain pine were successful, but now—in the second generation—more or less mixed cultivations are taking over.

For instance silver firs have been used mixed with Douglas or beech, oak and red-oak. The silver fir is growing well in many plantations where the rainfall is sufficient, but there is danger from spring nightfrosts and deer. However, a forester found out by accident that this could be prevented by planting a two year old silver fir in the same hole as a Scots or contorta pine. The fir is then growing up between the branches of the pine, and when the danger is over the pines are cut down.

Treatment of the stands.

It must be said that most Danish foresters prefer pure stands, but I, myself, advocate mixed stands in some cases, as it is possible in that way to keep the soil and the stands sound, and if damage is done by storms, insects or fungi there is something left under which the new generation can be protected while growing up. Also, I am not afraid of unevenaged stands and am trying selection fellings ("plenterwald") in some stands of mixed ash, sycamore maple, beech and some oak and alder.

However, the idea of mixed stands is spreading, especially in the heath.

The *Danish thinnings* are often mentioned by foreigners. It originates from the ideas of the Danish Count Reventlow (1748-1827) and have been developed further. Reventlow was influenced by the books of the Frenchman, du Hamel, and the Englishman, Evelyn.

The result of the thinnings is rather few trees per acre. For beech, 120 years of age, less than 40 per acre, and for oak, 150 years old, about 20 per acre. These results, however, are obtained not by a few hard thinnings, but with very frequent thinnings. In the younger stands the interval does not exceed 3 years and in the oldest seldom 6 years. Generally, each thinning does not exceed 15% of the volume in the younger stands and 8-10% in the older.

Of course, such thinnings can only be practised, when the market conditions, the small forests and a great staff allow it, but we consider it very important to "educate" the trees gradually, to prevent shocking the stand as the strong evaporation caused by the frequent winds, together with the low precipitation may diminish the growth.

As an average the yearly fellings are about 70-80 cubic ft. per acre, but in older forests it is generally about 110-130 cubic ft. per acre.

In short, the best of Danish forestry cannot be characterised better than by the introduction to the first Act of 1781 about the treatment of the State forests: "The aim should be to follow and help nature in her actions".

Also in other ways Danish forestry differs from those in other countries.

Administration.

A *Danish forest district* with a graduate forest officer as chief is only 2,500-5,000 acres in the old forests, considerably more in the heaths with 17,000 acres as a maximum. The districts have generally 2-4 educated foresters. The district officer and the foresters live in houses belonging to the district and situated in or on the outskirts of the forest, so that they have a very close connection with their working place.

My district, now belonging to the State but bought from a Count's domain in 1930, is only 4,500 acres and I have 4 educated foresters, as

the woods are situated rather far apart. We have 33 miles of macadamized road for motor transport, not counting the by-roads belonging to the municipalities going through or along the forests.

On private estates there is generally a graduate forest officer even if the area is only 2,000 acres, but in many cases they are acting as land-agents as well. Many forest officers have other jobs too—Inspectors of the private forests or private administration of smaller private districts.

The forest officer himself generally marks the trees for thinning and opening up, but of course the foresters do their part, especially in the coniferous stands. We consider it very important to get in close contact with the stands and in the 23 years I have been in charge of my district, some stands have been thinned by me personally up to 11 times, so that I am really acquainted with them.

Up to about 30 years ago the private forests on the demesnes were absolutely taking the lead. Now there is no difference between the private forests and those belonging to the State.

By Act of 1919 the conditions for the private estates were altered. The fiefs, the entailed and family estates were then transferred to private property, but the forest must not be divided into plots of less than 1,500 acres each. However, the conditions were altered with the heavy taxes and succession duty—the same as in Great Britain—so that an owner could not be sure that his grandchildren would get the results of his improvements. The net profit at the same time became more important, which meant that the object of the forest as a place for game was diminished.

For all bigger estates there are now working plans. In the State forests the oldest were made 1763-70. The plans are revised every 15 years in the State forests and generally every 20th year in the private forests. However, the plans are not arbitrary and the forest officer has a great influence on them.

It is characteristic of Danish forestry that even in the State forests, the forest officer may manage the forest to a considerable degree according to his own ideas thus giving the greatest opportunities for development, but at the same time the greatest responsibility. As it is very common that a forest officer is in charge of the same district 30-35 years—some private foresters have been up to 50 years in the same place—such a man will get a considerable knowledge of the local conditions.

Furthermore, even an officer in the State forests, is not limited in his work with the sale of timber. Of course, we do have some minimum prices and large sales must as a rule be approved beforehand, but when that is done, we can deliver the wood, when paid for, without further approval. The firewood is generally sold by the foresters, the prices being fixed by the forest officer before the felling season. There is a control of the amount of fellings in that the workers are paid by piece-work and assist in the measuring.

Of course, we do have some tendency to centralisation, but we fight against it, as we believe that decentralisation is the road to progress.

The small woodland owners (those with less than 125 acres) have now, to a rather large extent, joined together and formed associations and have engaged forest officers of their own as advisers and visiting agents. The State is paying a part of the expenses. In this way it is also possible to sell the timber wholesale even if it must be delivered from many owners. Owners of about 30% of the area of the small woods have joined and some of the rest have privately made connections with local foresters.

Education.

The first school was founded in 1786 and since 1863 the graduate foresters have been educated at The Royal Veterinary and Agricultural College in Copenhagen. The course takes 6 years of which 2 years are in the forests. On an average 13 pass the final examination each year, but the State forests can only make use of 1 to 3 of each batch.

The proper education of the foresters commenced in 1906. It takes 4½ years and it is practical as well as theoretical with the principal aim of giving them a good education in the leadership in practical work. About 30 pass the examination each year.

Since 1948 we have had a training school for forest workers giving them a free 4 weeks' course in using the tools.

Scientific forestry institutions.

The Danish Forest Experimental Station was inaugurated in 1901, but some sample plots have been measured since 1852 by the State working plan office. Some twenty volumes of reports have been published.

Forest Tree Breeding, started by the well known Dr. Syrach Larsen, is connected with a new Arboretum of the Highschool, and the work is very important. Controlled pollinations from selected trees are being made, as well as vegetative propagations (grafts, buddings, etc.) and founding of "Tree Shows" to study the inherited characters of individuals.

The Danish State Forest Seed Extracting Plant and Tree Improvement Station supply the State forests with good seeds and have cold chambers for storing conifer seeds for several years. They are also working with improvement experiments with Dr. Syrach Larsen as consultant.

The Seed Board was appointed in 1937 by *The Danish Forest Society* and about 400 stands of different species have been approved for breeding. The seeds are sold under a written guarantee and most commercial nurserymen have pledged themselves to submit to control with regard to the use of the seeds and give information as to the origin of the seed in the invoice.

Of course, this could only be an introduction. Further information may be had from my book "Forestry in Denmark" (published by The Forest Society), and I hope that the plan for an excursion to Denmark next year, may give some of you the opportunity to get personal impressions of the matter.

IRELAND.

Now I come to the most difficult part of my lecture—speaking about the Irish Forests.

First, I must say that I have been very much impressed by the tremendous planting programme and by all that you have been able to do during the last 30-40 years.

I understand that it is mostly the poorer soil, which has been taken over for planting, and this, of course, must limit the choice of tree species.

Just as we on our heaths have been limited to spruce and mountain pine as a start, you have reasonably used Sitka spruce and contorta.

Everybody knows that you Irish love betting. "The Irish Sweepstakes" are known all the world over. But even if it can be of advantage for an individual to put his whole bet on one horse, it may be a bit dangerous for a nation.

Of course, Sitka spruce is cut out for your climate, but I think you may have great difficulties, when those enormous, evenaged areas are to be regenerated. To some extent we have the same problems with the spruce, but the spruces on the heaths are not so evenaged over big areas as your plantations, they generally alternate with younger stands or stands of mountain pine. Even when we use wedge regenerations, we can have trouble when the butt-rot fungus attacks and the storms come.

However, I do not have the impression that the common butt-rot fungus does much damage in Ireland so far, but in Kerry I saw the beginning of an attack by another root fungus in a 20 year old Sitka stand, and I do not think there is any other remedy than trying to keep the trees as healthy as possible.

In Denmark we have had *Fomes annosus* attack rather bad in Sitka, and, as mentioned, it was followed by bark beetle attack.

Even if the Irish climate seems to suit the Sitka better than the Danish, probably thus making the trees more healthy, you may get some damage in the future.

Of course, I am not sufficiently acquainted with the local conditions in Ireland to be able to tell you what may be done. If I should propose something I should say that it might be well to make a groupwise mixing with *Insignis* (*Pinus radiata*) or Scots pine or preferably if possible some hardwoods (for example *Prunus serotina* as they do in Holland).

Speaking about the Sitka, I must say that I have been very much impressed by your thinnings. They have been very intensively carried out, although it has been a tremendous job on big areas with no local market for the fellings.

If the Sitka is wonderful in Ireland, I do not think that the same holds good with regard to the Douglas. However, I have seen some wonderful 80 years old Douglas mixed with larch and beech in a very small forest at Lauragh in Kerry, but the younger stands do not seem to come up to this standard, and you seem to have the same opinion about the thinnings of this species as I myself, held before. But in Denmark at least while studying the older stands, I have come to the opinion that they can better stand rather close. I am fully aware, that there is a dangerous time for this tree, when it is young and the roots have not developed sufficiently and then you have to thin rather hard to develop the roots. Of course, thinnings must take place, but in a less degree when they are older, thus it is also possible to get a more valuable timber and, I suppose, a bigger yield.

I also think that the seeds you have got in the later years are not of so suitable a provenance as that of the old trees. It might be a good idea to get some seeds from good stands in Oregon or Washington just behind the Sitka fog-belt. We have, as mentioned, had the same problem at home between the wars, and especially for Douglas the provenance means so much.

In Avondale I saw a beautiful young stand of Western red-cedar (*Thuja plicata*), but I did not meet this tree later. Especially on your moist mountain sides there ought to be many places for this wonderful tree, which, together with Douglas and Western hemlock, makes the beautiful forests of Western America.

Another tree I missed was the silver fir. At Cloragh in Wicklow I saw some wonderful single trees, 120 years old, and Mr. Clear has started to use the natural regeneration. Also in Dromore forest in Kerry there was a fine regeneration of this species under beech. But this tree ought to have great possibilities in the moist parts of Ireland, perhaps, if possible, mixed with beech.

To me it seems that the trees in the old parks are giving a hint in many ways. I remember particularly the Adare park near Limerick where even *Sequoia* shows a fine growth. I am aware that this park is set on limestone, so that the results may not be comparable with those on shale soil, but some of your forests are on limestone.

The hardwoods, beech and oak seem to me to originate from former coppice, and they might give a better result from seeds. In some places in Kerry there were most promising natural regenerations. The sycamore maple should do very well especially on the limestone improving the soil conditions, and even, according to Lord Bolton, it may grow well on shale.

All told, it seems to me that you have enormous possibilities in Ireland for forestry, but I am aware it will take some agitation and many years to make the inhabitants "forest minded". I could not understand that admission to the forest at Killakee just outside this town was prohibited although it is a State Forest. I learned that there

was danger of fire. We have also difficulties, mostly in the neighbourhood of Copenhagen, where people have free admittance to the forests, but we have generally nothing to complain of concerning the Boy and Girl Scouts, and efforts to get them interested have been successful, but it is also important to interest the school teachers. In U.S.A. they have succeeded, and we—in Denmark as well as Ireland—must not be tired of creating good-will for the forests.

This and the rest of what I have mentioned may sound impossible. The Germans speak about the "ironhand law of locality" (*Das eiserne Gesetz des Ortlichen*), and, of course, one must be acquainted with the local conditions, but not everything is impossible.

I am happy to tell you that my favourite quotation is of Irish origin. I found it in a book of an authoress in U.S.A.—the country where most Irishmen seem to live. It was by Mary O'Hara in her beautiful book "My Friend Flicka", where the father said to his son: "You know the saying, 'It couldn't be done', but the darn fool didn't know it and went ahead and did it". Now and then one might try to do the impossible.

I have now tried, if not the impossible, at least something difficult, to outline my personal impressions of forestry in Denmark and Ireland.

In forestry more than in other professions we have for many years to try to get the best results of the work of our predecessors, just as those coming after us must try to make the best of our ignorance and failures. Fortunately there will always be knowledge to gain, nothing is definitive.

Here, in Ireland, you seem to have a good and clever staff of foresters, who seek to co-operate not only with Great Britain, but other countries as well, and in wishing you the very best for your forestry, I do hope that I have not offended you with my remarks. They originate from the love you and I have for our wonderful occupation and our life—the forest.

Some Experiences in the Survey and Inventory of Growing Stock for Forest Management Purposes.

By THOMAS CLEAR

(Paper read at the Annual Meeting of the British Association for the Advancement of Science held in Dublin, September, 1957.)

WHEN one tries to compare the position of Forest Management in Ireland to-day with that in the countries of continental western Europe, it is difficult to find any close parallel. It is interesting, however, to read and study earlier reports and working plans and to find that about 100 years ago many of the best forestry estates in Germany and Denmark were in a development stage similar to that of some of our own forests to-day. It is a heartening experience too, to drive through extensive blocks of high quality timber and to learn that where these fine crops now flourish was once poor pasture, heath, scrub or devastated woodland. It must be recognised that forestry on the Continent has grown up in different times and conditions from those to which we are subjected to-day. During the 19th century the growing forest industry was greatly encouraged by the rapidly increasing demands for industrial wood occasioned by the industrial revolution. Railways and canals opened up new markets, while the vast increase in urbanisation, the growth of mining and the development of the paper industry on a wood base made ever greater demands on the forest. The evident value of forest property created a lively interest in forest management and forest economics among owners, managers and government officials. There was a growing concern about the future supply position and a natural pre-occupation with the problem of demand and supply. The young forestry profession was acutely aware of the dangers and possibilities of this increasing hunger for timber. The lure of ready markets was a constant threat to the very existence of the forest. The economists were ever ready to preach a doctrine of short rotations and quick returns from plantations of industrial wood, while the silviculturists were anxiously trying to create a biologically sound and healthy forest which would be proof against all vicissitudes. The social and industrial implications of forestry were early recognised and the enlightened management introduced into many private and state forests in those trying years is a tribute to all concerned.

The situation of growing demand and declining reserves of timber called for regulation and control and the man who stepped into the breach was the forest mensurationist. He was called on to provide statistics for industry, to produce formulae for the forest manager and the taxation officer which enabled them to calculate and forecast the potential of the forest estate. His services were in demand for cruising

timber reserves, for the assembly and interpretation of statistics for commissions of enquiry. This pre-occupation with the measuring and rationing of the forest resource to the practical exclusion of the problems of regeneration and perpetuation became the subject of a growing volume of criticism from the forestry profession with the result that forest mensuration suffered a progressive decline in popularity in forestry circles on the Continent. The nature and extent of this fall in prestige was aptly described by a quotation which was frequently on the lips of German forestry students, with whom I studied in 1936 and which went somewhat as follows: "Wagner elevated forest surveys and assesment to the position of Director General with palatial offices of its own while Möller reduced it to the position of a bookkeeper who sat in the outer office of Director Silviculture."

This partial eclipse of mensuration by silviculture in central and western Europe still prevails and is to some extent responsible for the relatively slow development of new mensuration techniques on the Continent. To the Irish student it is a remarkable experience to find that the highlights of a continental forestry excursion are mainly concerned with silvicultural and protection problems while in Great Britain and Ireland there is a marked emphasis on yield prediction and mensuration techniques. The reason for this contrasting state of affairs is not far to seek. On the Continent the business of forestry is well developed and highly organised and the machinery for collecting statistics is working smoothly and well. Frequent inventories have been carried out since about 1800 and the enumeration of growing stock in the forest is a routine job. These repeated stocktakings together with the accumulated records of timber felled, transported, converted and utilized add up to a unique and complete body of statistics which arouse the admiration and envy of countries with an underdeveloped forest industry.

Irish forestry is relatively immature and in the formulative stage particularly in the fields of utilization and management. The main and natural emphasis in the past has been on establishment techniques and the approach to management and marketing has been largely exploratory. We are not alone in this respect and in many ways the problems confronting the Irish forester have much in common with those of British forestry and of countries like New Zealand and South Africa. There is a risk of over supply of low grade wood from thinnings which make the problems of management and marketing the immediate concern of the central authority whose task it is to avoid waste in the public interest. There is, therefore, a natural pre-occupation with questions of yield and output in the immediate future. A good deal of progress has been made and in this connection we must recognise that we owe an immense debt of gratitude to the research workers of the Forestry Commission for seeing us so far on the road. The time has come, however, when we must begin to solve our own problems in our own way.

The relatively backward state of Irish forestry can be readily explained by reference to the forestry developments over the past 50 years. At the turn of the century there were no state forests in this country. Private woodlands were in active liquidation and whole timbered estates were falling on the market for a veritable song.¹ Timber prices were low and up to 1914 pine and spruce, where saleable at all, was fetching about 1d. or 2d. per cu. ft.² There was no market for small thinnings. There was little scope for refined tree measuring under these conditions and the ideal of sustained yield management a student's pipe dream.

My active experience in Forestry goes back to 1930. At that time the forestry situation, while improved in some respects compared to the pre-1914 position, was considerably worse in other respects. The huge wartime clearances had swept away many of the best stocked areas; estate management was at a standstill; agriculture was crippled; and the timber market virtually non-existent. Woods were impenetrable and scarcely ever entered except by an occasional shooting party. Foreign timber flooded the market at give-away prices and forestry was a 'dead letter' except in the state plantations. The oldest state plantations were still scarcely 20 years old and covered in all less than 30,000 acres out of a total of perhaps 250,000 acres of nominal woodland. Measurable crops of the newer conifers were few and far between and one can safely say there were few forests with even a skeleton working plan, to say nothing of forests, managed on a textbook pattern.

If opportunities for measuring forests were limited so also were suitable tools and tables. But things were happening. We had the first fruits of British research coming to hand in the field of forest establishment and nursery work but more valuable still in many ways, Bulletin No. 10³ on the growth and yield of conifers. It is difficult for the present generation of students to appreciate the impact of this publication on forestry teaching and thought during those important formative years for Irish Forestry. Here at last was a publication which brought native forestry right into perspective. More important still it provided the propagandist and economist with wonderful opportunities for bringing home to the government and all concerned the wonderful potential for the production of wealth possessed by the western American conifers. The dawn indeed was breaking and the new day was ushered in more brightly by another publication which appeared on our shelves around that time—"Hiley's Economics of Forestry."⁴ This book was of vital importance to the student and teacher alike. These two publications taken together can be said to have heralded the new era of forest management in Ireland. They made us yield-conscious for the first time. Hitherto the emphasis was on planting for planting's sake and on forestry as no more than a social welfare scheme. To put it briefly then, in the early thirties there was a definite shortage here of suitable opportunities, equipment and books for the student and teacher of forest mensuration and management.

Training Abroad.

The absence of these facilities was recognised and it was customary to send students abroad for a few weeks to get working plan experience in France or Germany where forestry was highly developed. The forests selected were usually delightfully well-recorded, with simple well-defined enumeration and mapping problems calculated to provide for the student in the time available a suitable exercise along textbook lines. Small wonder that little progress has been made in the field of working plans in these islands and that the subject itself can rouse controversy whenever mentioned at any forestry gathering.

The authorities in University College, Dublin broke with tradition in our case and my colleagues and I, who formed the first group of students to complete the University course here in Ireland, were sent to Sweden in the early summer of 1935. By arrangement with the Royal School of Forestry, Stockholm and under the personal direction of the professors of the school, we were able to participate for a period lasting many weeks in the new line plot system of forest inventory then being tried out in co-operation with the Forest Research Institute in Sweden. This new Swedish National Forest Survey⁵ set a pattern in forest inventory which has been copied by forestry services all over the world and is applied in conditions varying from the northern tundras to the tropical jungles.

I cannot claim that at the time I was aware that I was participating in a research project of profound importance to forest management in Ireland. I could see little scope for the application of this method of forest inventory to the Irish woodlands of the year 1935. It was, however, a most stimulating experience and aroused an interest in forest inventory problems which has remained ever since.

The German System.

Following almost directly on this 4-months' course of field work in the woods of Dalecarlia, I went on to study forest management in the Forestry High School of Eberswalde in eastern Germany. Here, in a school set in the midst of the Prussian pine woods we were taught the classical system of forest inventory with detailed, unit-by-unit recording of forest stands, each sub-compartment like pieces of a jig-saw puzzle together making the complete picture. This system of detailed stand and site analysis demands a very high level of training, not alone in the field of mensuration but in the fields of ecology, soil science and meteorology also, since all the factors of soil regulation and climate were recorded in considerable detail. The final complete working plan and stock map gave every detail of the history and composition of the forest. Inventories were often tree-by-tree enumerations in the older and valuable age classes, with crown diagrams and crop profiles. Crop statistics, timber quality ratings and genetic characteristics, all demanded attention on the field forms. On the other hand the pole woods simply

got a quality class rating with an ocular record of stocking density and mixture which was supplemented by the planting records. Only the unsatisfactory young crops were given any real going over. Further periods of study in south and west Germany brought to notice more intensive forms of forest inventory with a bewildering range of forest types, mixtures and management systems. These were often of local origin and evolved by managers, each of whom had apparently spent a lifetime striving for a unique system of his own.

The general tendency, it appears to me, is for the style of inventory to change from north to south. In the north the aim appears to be, cheap and rapid coverage of the vast areas involved. Simple, scientifically developed field recording techniques are used, with mechanical sorting and tabulation of data by a central office used to the maximum extent. In this way up-to-the-minute and accurate information of value to administration and industry is provided at low cost but little in the way of special information to the local manager who has in any case very little time or opportunity for detailed silvicultural intervention in his forests. The poor soils and low yields do not warrant intensive management and detailed information on locality factors are not necessarily required.

In Germany, Denmark and Switzerland, however, the pattern of forestry is very much complicated by the needs of local industry and agriculture in the immediate neighbourhood of the forest. There are markets for a wide range of products from firewood and vineyard stakes to veneer logs. Each locality has its own speciality in the way of wood sizes or timber quality which profoundly affects such vital matters as rotation and species mixtures. The forestry schools cater particularly for the needs of local administration and the managers in both the private and state services are all academically trained and are steeped in the traditions of the forest. The pattern of management is well established and changes very slowly, perhaps too slowly in these times of rapid change in fashion and demand.

System for Ireland.

In this short review of the forest assessment practices as I have experienced them I have tried to show that there is a very wide range of methods from which to choose. The value of the forest in general and the level of production as indicated by the nett earning capacity of the average acre determines the pattern of management and the form of inventory.

When it fell to my lot to evolve a course in Forest Mensuration and Management suitable to Irish conditions there was no readymade system on which to go. I have tried out many different forms of inventory under different conditions to see if any pattern would emerge to suit our own peculiar needs. The problem indeed remained as how best to provide students destined to work in Ireland with knowledge

and skill in the task of bringing extensive areas of relatively undeveloped, unrecorded coniferous plantations, abnormal in age class distribution, under systematic, sustained yield management. There was also the apparent need for trial stocktakings which were calculated to reveal something of the size and composition of the growing stock in the more advanced plantations and which would be a pointer to the rate of growth and the immediate yield potential of our rapidly expanding forest estate.

Since 1946 through the kind permission and co-operation of the Forestry Division, Department of Lands, and the owners of several large private estates, the author has carried out a number of forest assessments. The main purpose was the training of students in enumeration and stock mapping for forest management purposes. Still, wherever the opportunity presented itself, methods suitable for the cheap and rapid assessment of growing stock were tested and developed. In the state forests covered by these surveys, a large unit or single forest property of from 800 to 1,200 acres was usually completely surveyed and stockmapped. A modified line plot survey⁶ proved to be the most satisfactory method of stocktaking in these extensive, even-aged, mountain forests. The mapping and stocktaking was done by running compass lines against the prevailing slopes across the contours. Crop changes were plotted by continuous linear measurement along the lines. The location of the survey lines was fixed in advance by superimposing a grid on the map. Usually a 4 chain by 5 chain grid and sometimes an 8 chain by 5 chain grid was used. The sample plot centres were taken at the intersections of the grid lines. This close grid allows of very accurate mapping of crop boundaries and insures a really adequate sampling unit. The continuous linear measurement enables the survey party to record improvements such as new roads and also to detect errors in the location of compartment boundaries.

The most suitable sample plot proved to be the diamond-shaped plot⁷, which was normally one-tenth of an acre in size. It could be expanded to one-fifth acre or reduced to one-twentieth without any trouble. This is very necessary as the size of the timber and the stocking per acre varies considerably with the age class. Under good conditions a survey party of three can lay out and enumerate a plot, record heights, and take increment borings or leader measurements in less than 10 minutes.

During these surveys it was usual to test out different methods of quick enumeration as recommended by various workers. The one by Professor Weck of Reinbeck⁸ proved to be very fast and gave results consistent with our plot enumeration results. The relascope or angle gauge method proposed by Dr. Walter Bitterlich was also tried out. The simple form of relascope, the road and blade type was found to be reasonably reliable. The more expensive and more elaborate instrument, the⁹ Spiegel-Relascope did not fully live up to our expectations.

Measurement made under good conditions gave a stand basal area per acre that deviated on occasion by as much as 20% from the callipered measure. In addition it is not possible to separate the quarter girths or species without considerable difficulty. It is possible for trees to be hidden by others or for small trees to appear to merge as one, especially in dark spruce stands. The eyes tire readily in winter time in heavily stocked pole woods. It is sometimes impossible to use this instrument in older weed-infested crops of pine and larch, and even in Douglas fir and spruce, briars and elder frequently reach well above breast height. We found it very desirable to mark the trees firstly to prevent them being recorded twice, a very real danger.

One of the most useful methods which came to our notice was that of Hohenadl¹⁰ as described and modified by Krenn,¹¹ called the "Method of the Two Mean Trees." This method provided sample trees for increment study and for local volume table construction, as well as for the calculation of the basal area of the stand and the volume per acre.

In the ten years' period during which these trial inventories have been regularly carried out, close on 8,000 acres of fully stocked plantation have been recorded. The areas covered represent a useful sample of the extensive plantations laid down by the state in the period between 1910 and 1930 and by the large private estates over the last 100 years. The cost of the field work ranged between one shilling and two shillings per acre. The work was done by relatively inexperienced student labourers who were also entrusted with the compilation of the statistics and stock maps. The final reports have been put up in the form of conventional working plans in the case of the private estates and in two instances have been adopted as a basis of management with excellent results. Thinning programmes, fellings and financial returns have turned out as forecasted so that the plans can be said to be working in every sense of the word.

The volumes of timber returned in these field exercises varied from 1,000,000 to 3,000,000 Hoppus feet per survey and the forest properties covered ranged from large blocks of coniferous plantation in one age class on difficult mountain land with a wide range of growth rates, to well developed and highly productive old woodland sites with a fairly normal age class distribution. These line plot surveys together with the studies on the felled sample trees on increment and growth history of the stands in question, provide a wealth of instructional opportunities and are an excellent form of training for students. When combined with a study of the local conditions,¹² including soil depth and type, ecology and local water regime as influenced by topography, they give a very valuable insight into the fundamental factors of production.

The writer is of the opinion that there is a need in Ireland for a form of inventory which is intensive enough to provide for working plan purposes and is not so detailed and costly as the Continental form

of stocktaking. This form of inventory should not be confused with national or regional stocktaking along the lines of the census¹³ of woodland being carried out in Britain. There is need for both so that we can become more and more thoroughly informed of the forestry production position not only in the country as a whole but in every single productive compartment in our forests. When that position is reached we can be assured that the why and the wherefore of failure and success will cry out for answer and the forest technician will enter into his own at last.

REFERENCES

1. Forbes, A. C.
Production and Value of Irish Timber. Journal, Department of Agriculture and Technical Instruction. Vol. XV. 338.
2. Nisbet, W.
Departmental Committee on Irish Forestry. Report, Appendix 15.
3. *Forestry Commission, Bulletin 10*, 1928.
4. Hiley, W.E.
Economics of Forestry. Oxford 1930.
5. Hagberg, Erik.
The New Swedish National Forest Survey. Unasylva, Vol. 11, No. 1.
6. Chapman, H. H. & Meyer.
Forest Mensuration. McGraw-Hill Book Co. 1949.
7. Bickerstaff, A.
Canada. Dominion Forest Service. Silvicultural Leaflet. No. 25.
8. Weck, J.
Schnellverfahren Zur Ermittlung von Holzvorrat und Zuwachs in Einzelbeständen der Gemässigten Zone.
9. Daniel, T. W., and H. Sutter, 1955.
Bitterlech's Spiegel relascope. A revolutionary general use forest instrument. *Journal of Forestry* 53.
10. Hohenadl, W.
Einführung in die Bestandesrechnung mit Hilfe von 2 Mittelstammen. *Forstw. Centralblatt* 1939.
11. Krenn, K.
Die Bestandesmassenermittlung mit Hilfe stehender Probestämme. Schriftenreihe der H. Göring Akademie Deutscher Forstwissenschaft. Band 8; Sauerlander Verlag Frankfurt/Main 1944.
12. *Meddelelser Fra Det Norske Skogforsoksvesen*, Nr. 45 (Bind XIII Hefte 2). Investigations on forest soils in Telemark county, Norway, in connection with field work of the National Forest Survey.
13. *Forestry Commission*. Census Report No. 1. 1952.

A Note on Nursery Mechanization.

By O. GRANT

THE use of machinery in the carrying out of large scale nursery operations was initiated at the Forestry Division's Nursery at Clonegal this year. Although it is, as yet, too early to pass final judgement on the merits or de-merits of mechanization, a preliminary glance at the matter may be of interest. Let us deal with the machines* in order in which they were utilized.

1. *The Ledmore Lining-out Plough* performs in all nine simultaneous operations. Let us assume that one line of seedlings or transplants has been affixed to a previously prepared line in lining out operations and the tractor, with Ledmore plough attached, has been brought into position at one end. The plough in its passage up or down the line, as the case may be, carries out the following operations:—A small front skimmer moves the soil from the furrow in against the roots of the trees. Following this a compaction wheel, rubber tyred, presses the soil firmly about the roots. A plough-share attachment turns the soil inwards, a soil leveller levels the surface and a metal roller rolls it flat. A raking device takes off any surplus soil which may have become piled up against the lining-out boards. A rear cutting disc cuts out the next line trench. A rear reverse skimmer moves loose soil to the outer edge of this and, lastly, from a metal container, attached to the plough, an even flow of artificial manure is deposited in the trench.

The Ledmore plough was used with a complement of fifteen men. Seventy-two lining out boards were employed on a line one hundred and twenty yards in length. The workers were divided as follows:—One ganger, one tractor driver, one labourer, whose function it was to follow along after the plough and square off generally, or otherwise assist the operation. The remaining twelve men were divided into units of four. Each unit had charge of one-third of the line. There were three fillers to keep the boards replenished and one man to carry these to the line and to return empty boards to the fillers after passage of the plough. It was possible to reduce lining out costs by fifty per cent. but one must get away from the idea of having those straight, geometrically laid lines which generally follow manual lining out. The Ledmore plough worked well up and down gentle slopes but failed to do a good job along contour.

2. *The Tractor Rotovator*. Enough praise could not be given to this machine. Its rotating blades leave behind a fine meal-like tilth to a depth of seven inches. This machine is a 'must' wherever the Ledmore plough is used. Without the benefit of this precursor the Ledmore

* Some of the equipment mentioned in this note was designed and developed by the Forestry Commission and the Ministry of Agriculture, Northern Ireland.

—Editor.

plough will not function well save, in soil of optimum friability. Its work is far superior to that of the ordinary disc harrow which was used for purposes of comparison. The rotovator will always do more than pay its way and would confer great benefit in otherwise manually operated nurseries. It is possible to cultivate one thousand one hundred and eighty square yards of ploughed ground, in one hour, with this machine.

3. *The Ridger* was used on ground previously prepared by means of an all-purpose plough, disc harrow, tractor rotovator and three-ring plain roller. Lines, one hundred and eighty yards in length and five feet apart were marked out on this seed bed area with the aid of ordinary garden line and a wooden handle. The tractor, using one of these lines as a guide, drew the plough behind it. Two parallel blades cut out the bed and a smaller one, actually a stabilizer, centre-ways between these two, broke up the middle of the bed, in such a way, that a drag chain attachment affixed to the rear of the machine could level this loose soil, giving the whole the usual seed-bed formation. A few men followed the machine with rakes to put the final finish to the bed surface. Using this machine, it was found possible to prepare three hundred and eighty square yards of seed-beds in one hour. A thirty-inch hollow metal roller, also tractor drawn, followed the Ridger and the bed was then ready to receive the seed.

4. *The Drill Seed Sower* lays down six bands of seed lengthwise on the bed. The bands lie six inches apart and a margin of like width is left towards each bed edge. The machine comprises six metal seed containers, each being fitted with an interior revolving brush which assists the passage of seed to the conduction pipe. The rate of flow of seed from the container is controllable by rotating discs set close to the side of container and external to it. Each disc is bored through by holes of ascending sizes one of which, to suit size of seed to be sown, being brought into position, allows only a certain rate of seed flow to the conduction pipe. A viewing panel enables the hole to be properly adjusted in relation to the container outlet. The seed passing down the conduction pipe is deposited on the bed in a neat band line. The bottom end of the conduction pipe comprises, besides the seed outlet, a small dual-purpose plough which scores the bed surface to the required band width and depth. A metal cuffing plate follows the attachment, to cover in the seed. A small wooden compaction roller suspended on a metal arm brings up the rear behind each conduction pipe and this rolls the seed cover into place. When covering with sand is adopted, the metal cutting plates are removed. The Drill Seed Sower will lay bands over three hundred and ninety square yards of seed beds in one hour. The tractor should be speeded up as much as possible as this will ensure uninterrupted seed flow. The machine is suspended on two rubber tyred power drive rollers travelling in the seed bed alleys. Rotation of these activates the seed-discharge mechanism viz. a series of cogs. The beds stand three inches above the alleys.

5. *The Grit Distributor* is used for spreading the sand with which the seeds are covered. It can also be employed in spreading artificial manures over green-crop areas. The Distributor, on two rubber tyred wheels, can be drawn fairly fast behind the tractor. An adjustable shutter device regulates the sand fall. An interior rotating spiked spindle keeps the sand agitated. Speed is essential in the use of this machine as, otherwise, the sand will pile up in ridges across the bed's length. Five hundred and forty square yards of seed beds can be covered in one hour by using this machine, which is replenished from sand dumps conveniently placed.

6. *The Inter-row Cultivator* does work similar to that achieved by the use of the bucco. It is possible to hoe two yards width of transplant lines in one passing. Unlike the sand-spreading machine, the cultivator should not be speeded up, as the least deviation from the true line will cause the tines to drag trees from the transplant lines. The machine is not supported otherwise than on the tine points and the eye of the tractor driver determines the quality of the work. It is, however, possible for a good tractor operator to hoe eight hundred square yards of transplant lines in one hour. The machine does better work in areas lined manually than in areas laid down with the aid of the Ledmore plough. A reduction in the number of tines and a flattening out of the grubbing ends of these may increase the efficiency of this machine.

7. *The Sprayer*. This is a forty gallon machine having nine jets for spraying purposes. Owing to the fact that in a mechanized nursery an eighteen inch alley is left between every five lines of transplants, to allow passage to the tractor wheels, it was necessary to block three of these jets. It was necessary too, to construct a seat projecting somewhat behind the sprayer. From this vantage point one man, seated, can control the cowl placed about the six operating jets. A seed-bed lath bored through at nine inch intervals and taking the jets and hoses through these holes facilitates cowl control considerably.

8. *The Transport Box*. This three feet by two feet steel box, attached like all the above machines to a tractor by means of three-point linkage, gives good service in the movement of trees about the nursery, the distribution of T.V.O. barrels and the removal of large stones from green crop area. In the latter instance and by lowering the box to ground level, it was possible to roll the stones on to the floor of the box thus avoiding the hazard of lifting them.

The above short resumé of the mechanization of Clonegal Nursery is but a preview of what it is hoped to achieve. Some indication of the possibilities may be gauged from the fact that the cost of preparation sowing and covering seed beds was reduced by seventy-five per cent., taking labour content only into account. It is hoped to further reduce the cost of lining out operations by providing and affixing rubber strips to the holding sides of the lining out boards. Some difficulty was occasioned by the inability of the wooden holding sides of the boards to keep trees securely held during passage from fillers to line.

Other items of equipment which have not yet been brought into use are a centrally-mounted U-shaped plant lifter with root-separating tines, an offset plant lifter for lifting tall transplants (over which the tractor could not pass without doing damage) and a seed-bed under-cutter. It is expected that these will be as satisfactory as the implements already used.

Some General Hints on the Making of Forest Roads.

By A. FLANAGAN

WHILE many of the ideas in the following contribution were taken from literature on road construction the writer has had practical experience of all the operations mentioned, gained in supervising the making of seven miles of roads at Galtee Forest, Co. Tipperary.

The planning of a good road system is essential to good forest management. As well as serving for extraction purposes, roads also serve ideally as internal fire-belts. For the latter purpose the network should be planned if possible at the time of planting, and preliminary work should be done at the first chance available. Good forest roads enable us to reach a fire more quickly by car or other transport, thus helping to prevent considerable damage. They may also be used to much advantage as inspection paths as by their dividing the forest into separate blocks, the forester becomes more thoroughly acquainted with parts of the forest he might seldom otherwise be able to see.

Gradient, haulage distance and the proximity of suitable metalling material are the most important factors to be taken into consideration when planning a road system. The following factors will, however, also have an important bearing on the cost of construction :—the width of the road to be made, the number of bridges to be constructed, the number of gorges to be filled and V bends to be built up, the depth of the banks to be cut through, the number of culverts to be made, and the quantity of boulders or large roots to be blasted or removed.

Road Density.

The correct road density is a much debated subject, but many are of the opinion that the most economical haulage distance to forest roads is 150-200 yards. Unfortunately most of our forests are on hilly ground, which only permits of one-way haulage, i.e. downhill. This means that most of our roads will be 150-200 yards apart depending on the slope of the ground. If the slope is very steep it may be necessary to have roads as close as 150 yards apart. If the forest is on level ground a two-way haulage system is possible, which means that roads will serve for extraction at 300-400 yards apart. In this way forest roads are a more economical proposition on level ground.

Ascertaining Gradients.

The use of T squares is one of the simplest methods of ascertaining gradients. Two T squares should be used, and a short plumb line should be affixed to each, the plumb line to hang directly from the centre of the horizontal bar of the T. The leg of each T should be 5 ft. long and the horizontal bar 1 ft., the leg being split from top to bottom with a pencil line. To ensure that the T is standing correctly vertical, the plumb line should coincide with this pencil line, and to make certain that the T is not leaning forwards or backwards, the plumb line should also hang just touching the leg of the T. One T should be held on the lowest point of the road, while the other is held on higher ground, for example, 20 ft. apart. On sighting the lower T against the higher one, the higher T should be marked where the line of vision meets it. Measure the distance from this to the top of the T and you will get the gradient in 20 ft. When planning the road site the higher T can be moved to suit the gradient required. By moving the Ts in alternating positions, gaining height as required, a road can easily be sited. The general opinion is that the maximum gradient may be as much as 1 in 10, but some steep inclines may be as much as 1 in 8, while other parts of the road may have very little gradient.

Aligning the Road.

Before any preliminary work is commenced, the road alignment should be marked out. It is very essential to walk the ground several times in order to become fully acquainted with the prospective site and any difficulties that may arise, and to have a definite point to be reached previously marked out. Short stakes should be driven into the ground about 20 ft. apart, and with the aid of the T squares the best and most suitable gradient should be obtained. For cross-sloping ground the tops of the stakes will mark the road for preliminary work, and no excavation should be done under this level as it would be unnecessary work. Poles should now be used to mark the upper and lower sides of the road. Where heavy excavation has to be done, an allowance should be made for this when placing the poles, so that the material excavated can be used to give a foundation of the required width. For example, the poles on the upper side of the road may be placed 5 ft. above the levelling stakes, and the poles on the lower side 8 ft. below the levelling stakes, depending on the depth of excavation to be done.

Road Widths.

Experts are not always in agreement on the most suitable widths for forest roads, but in the writer's opinion an overall width of 13 ft., seems suitable, while the metalled width need not be more than 9 to 10 ft. A margin of 2 ft. should be left outside the metalled surface. No special water channel need be constructed on the other side if the road is cambered and the ground is hard. Where steep banks are cut

through, they should be sloped to an angle of 60° to prevent material loosening and filling the side drain. The crown of the road should be the highest point when complete, being about 2"-3" higher in the centre than at the sides. Banks of soil should not be left on either side as these would hold surface water on the road, and where steep gradients are concerned may cause heavy erosion on the metalled surface.

Material.

The procuring of suitable material presents a big problem in road making. The amount of material required, depends on the type of ground to be roaded. If the ground is hilly there will be the problem of filling or bridging large ravines and deep hollows and the building of V bends, all of which use a large amount of stones and gravel. The finding of rock and deep layers of gravel on this type of ground is not unusual, particularly in Old Red Sandstone areas, when preliminary work is being done. Often there is found a good solid foundation, that needs no metalling, and which makes a very good road surface. The gravel found on this type of ground is ideal surfacing material. Such material is frequently found where heavy excavation has to be done, and, being on the site, helps to cut the cost.

Metalling.

If paving is considered necessary, it is best done by placing the stones closely together on edge, and then "blinding" with smaller stones. All points that require revetment, such as at the crossing of ravines, deep hollows and at V bends, should be built at an angle of 60° inwards, to ensure that no sliding occurs. Likewise where soil banks have to be made, they should also be sloped at an angle of 60° . After "blinding" with small stones, the surface should then be covered with 2"-3" of coarse gravel, a slightly clayey gravel giving the best binding surface. It generally takes a month for the surface to become consolidated and during this period compaction of the material should be helped by traffic. After this all loose stones should be picked, to produce as smooth a surface as possible.

Bridge and Culvert Construction.

The building of bridges and culverts needs careful planning and construction. Concrete pipes should be used as much as possible, but the erection of bridges will be necessary in some cases. Where pipes are used they should be encased in 1 ft. of material free from big stones such as fine gravel or soil. The object of having the material fine is the better distribution of the load so as to prevent the pipes from cracking. The inlet jaws should be built with stone to prevent erosion on either side of the bank. The bottom of the inlet should also be paved with stone to a distance of about 6 ft. out from the inlet, in order to prevent erosion under the pipes. The retaining walls

and both ends of the pipes should be pointed with cement mortar particularly at the inlet to make certain that there will be no damage done by water. The pipes should be allowed to carry a covering overhead of at least 1 ft. more than the diameter of themselves, for instance a 3 ft. pipe would need 4 ft. of covering. The maximum depth of water they should be required to carry should not exceed $\frac{1}{3}$ of the diameter of the pipe so as to ensure that no choking occurs.

Where the gradient is steep, it will be necessary to lay culverts at intervals of about 50 yards to lessen the water flow on the roadside and prevent erosion. This applies particularly where high banks have been cut through in which case a heavy flow of water may undermine the bank. When constructing culverts it is advisable to have the outlet 6 ins. lower than the inlet, as this will prevent them from becoming choked with washed material.

In the construction of large culverts, double and triple rows of 3 ft. pipes can be used and the covering material and retaining walls can be similar to those used in single-row culverts. Where bridges are substituted, either concrete or wooden ones may be built, but the concrete ones may prove cheaper and better in the end.

It may be argued that forest roads are very costly, but when it is considered that with light repairs now and again, they will serve several rotations, they should more than repay their cost.

Forestry and the Farmer.

(Contributed by a Co. Wicklow farmer with a forestry training)

AT first glance it would seem that forestry has no place in the ordinary day to day business of farming. Of course to the hill sheep farmer who sees his best summer grazing being encroached upon by the establishment of state plantations, the relationship between forestry and farming is obvious. Whether he approves of this development or not is a different matter. With a little give and take on both sides, the conflict between the interests of both parties could be amicably settled.

Now that the planting grant has been doubled there could be, and should be, a great increase in private planting. Much of this increase could come from small areas of an acre or less on ordinary farms. On most holdings will be found waste ground which could be most economically utilized by growing timber. You don't have to wait too long either for a return on your capital invested. Japanese or European larch will give quite useful poles from thinnings after 15 years.

It appears to me that much of the land reclaimed to agriculture in recent years, would be better employed in growing trees than in providing extra acres of doubtful value for grazing or tillage. I have in

mind low lying areas usually subject to flooding, which have been tile drained, ploughed, and re-seeded at great expense, and which at best will give a few months of summer grazing. It seems foolish to spend £20 an acre reclaiming land which will not have that market value when the job is completed. If such land were planted say with Sitka spruce, I have no doubt that it would prove a better investment. A plantation increases in value each year, the same cannot be said of reclaimed land.

Fencing poles and stakes are an every day requirement of the farmer, and there is no handier way to have them than from conifer thinnings in his own plantation. An acre of larch planted on a rocky slope with a grazing value of nil, would in a few years supply all his requirements. Proper care in the establishment and maintenance of plantations is essential. This is particularly so with regard to thinning. More woods are ruined by underthinning than overthinning.

Many farmers do not seem to realize the value of shelter provided by plantations, or the benefits that would accrue from having judiciously placed windbreaks on different parts of the farm. Some years ago in Co. Waterford, not far from Dungarvan, I saw a good example of the beneficial effects of a well sited shelterbelt. Here the farmer had planted a mixture of trees including Scots pine, Norway spruce and also *Pinus insignis* which provided such shelter that he could outwinter cattle on a bleak hillside, exposed to the South Western Atlantic gales. Without the shelter that of course, would be impossible.

Somebody may well ask who will buy my light thinnings if I go in for planting a few acres. It seems to me that with the development of plastics and the wood-pulp industry, which is bound to come in the next decade or so, any light conifer thinnings should find a ready market.

Now is the time when the rabbit population is under control, to plant the trees and increase the wealth and beauty of our countryside. We may not reap the full benefits of our planting efforts but our children will. After all, our generation has reaped the benefits of the plantings done in the 18th and 19th centuries, by that much maligned class, the landlords of Ireland.

N. J. DEVEREUX.

Outlines of the History of German Forestry.

By DR. BARON VON VIETINGHOFF-RIESCH,
Professor of Forest Protection, Goettingen University.

(Paper read to members of the Biological Section, University College,
Cork, on May 13th, 1958.)

THE history of German forestry differs from that of other continents and countries in a number of characteristics: Being a part of the old civilization of the Occident, Germany's history of forestry outdates that of other continents, such as America and Asia.

Compared with other European countries, a difference can be made

(a) With regard to the moderate German climate, which compensates for the damage done by man, and only very seldom puts *hiths*, moors, or bare rocks and sands in the place of devastated forests.

A hundred and fifty years ago our famous classic Heinrich v. Cotta was not far wrong in saying:—"If all people would leave Germany, before long the land would again be covered with woods without any human influence."

(b) Another difference consists in a development, whose outlines can already be seen. It began before man founded his first settlements, at a time, when the country was totally wooded, and led over long periods of clearing, over the unrestricted using of the remaining 25 to 30 per cent. of wood during the following centuries, to a timely reflection on the importance of the woods within the household of nature and within the household of man (sustained yield forestry). This development proved that not only princes and landowners protected the forests and attended to the game, that not only scientists warned against unrestricted using, and invented methods of cultivation and preservation, but that in the end the whole people—basically having a positive attitude towards the woods—became conscious of their value, too.

Up to this day other countries have been either so sparsely populated, or economically underdeveloped that the forests are no problem at all for them (for example Africa, South America, and large parts of Northern Asia), or, only very recently, they achieved a state of balancing the accounts of stock and using, *id est*, a state of modern economy, as in the U.S.A. Therefore they have no history of forestry, but at most a history of woods. Some countries, such as Asia Minor and Southern East Asia, have a very old history of civilization and thus a history of forestry, it is true. But the negative attitude of the population towards the forests, the insufficient protection by the government, and the very unfavourable climate and geological conditions led to the complete destruction of the forests, often as early as 2,000 years ago.

Thus an end was put to the history of forestry for the time being. It is continued only nowadays from poor relics. Spain, Italy, Greece, Turkey, and China, for instance, have no continuous history of forestry.

The history of forestry, the main features of which I roughly pointed out in my introductory remarks, is therefore the history of man's economic dealing with the forests of his native country. It can assume the character of exploitation or that of lasting conservation. The history of woods, as it took place without any human influence thousands of years ago and the history of the development of present stands of forest areas or of single trees are objects of the history of the woods or of the chronology of the woods and the trees, but not of the history of forestry itself.

Though I have stated a certain superiority of the German history of forestry to that of other continents and countries, concerning its historical importance, its course, and its development to a highly constructive standard, I have to confess, on the other hand, that, neither in regard to its age as an economic operation, nor to its ethical standards is it ahead of all the continents and countries. We Germans would be glad to take the lead in some respect or other, and, at the time of our classical forestry writers and their great followers, we actually did take the lead. This was true during the whole nineteenth century, from Georg Ludwig Hartig about 1800, to Judeich and to Karl Gayer, the great reformer of silviculture, who died about 1900. But Germany is not only judged by its prominent forest scientists, but also by the economic results of its forestry in the course of the centuries up to now. In this respect other countries were more fortunate than ours, whether they were spared from sizeable revolutions and wars, like Switzerland and Sweden, or, whether they were more sparsely populated, or, already very early, realized the importance of forests as protection against the inclemency of the weather, especially avalanches and torrents. In this regard, we are inferior to the Alpine countries with their old and essentially positive history of forestry, and also to Scandinavia and Finland with their larger forest resources, their excellent forest administration and their favourable distribution of property.

The German history of forestry in its historical sequence as a history of economics can be divided into four periods :

I. Up to the period of the Carolinginas—Charlemagne and his successors—that is, up to 900 A.D.

II. The history of forestry from the end of the Carolingian dynasty and the assumption of power by the Saxon Emperors up to the end of the Middle Ages, that is, from 900 to 1500 A.D.

III. The two hundred and fifty years of the history of forestry from the beginning of modern times up to the middle of the eighteenth century, when the first scientists appeared.

IV. The modern history of forestry at the age of enlightened despotism, of the great social and liberal revolutions, of the Romantic

Movement, of industrialism and the world wars, that is, from 1750 up to the present time.

Let us look at the **early history up to the end of the Carolingian dynasty**. It is characterized by two facts :

1. The foundation of settlements by Teutonic tribes after the end of the migration of peoples and the occupation of land (settlement).
2. The first regulations for the protection of trees and forests.

With reference to 1 : In the times of Tacitus, when the peoples of the East had not settled yet, and there were only few cultivated regions, Germany was almost completely covered with woods. When the settlements were founded, the density of the population began to increase, though not continuously, and it was therefore, not marked by a homogeneous tendency of settling. Simultaneously with the first clearings and settlements in the forest regions during the fifth century—they were often retrogressive because of the plague and other reasons—by orders of the kings the first forest laws were issued. They prescribed a certain regulation of forest use and were called "*leges barbarorum*".¹ But this process of clearing and settlement reaches far beyond the Carolingian epoch, and comes to its climax about the year 1200, after several ups and downs. From 1300 up to the present date, the German woodlands have not altered on the whole and amount to about 25 per cent. of the total area.

The occupancy of land took place in the following manner : Tribes and families established separate settlements or farms and cleared the woods, but left frontier forests, just as they stood, as protection forests against hostile tribes. Furthermore, they left a wooded part of the common land at the outskirts of their village, which was called "*Allmende*". Its use was permitted to all members of the village community for their own supply of wood and for pasture. This co-operative structure, however, has been preserved only in few parts of the German speaking area, as, for instance, in Tyrol and in Switzerland. Later on, in most cases, the forests of the co-operative communities were taken over by the claims of neighbouring feudal lords or by the appearance of single powerful members of the community. A part of the forests was merged into the later political community or was divided among the members of the community and became the farmers' personal property.

The first personal forest property owned by the crown was acquired by the Carolingians, claiming all unappropriated land for themselves. According to their sovereign rights they guarded it by special laws—thus making it first a game preserve. Here only the kings were allowed to hunt certain species of game. Later on, even clearings were pro-

¹ At those times in Latin all Teutonic tribes were called barbarians, without anyone using the word in a derogatory sense. Of late, an Italian scientist delivered a lecture at the University of Goettingen, in which—much to the amusement of his audience—he told that the devastations of the Italian forests were not to be ascribed to the barbarians, but to the grazing of goats.

hibited. In other cases, they gave the wooded land to their vassals, counts, clergymen, and monasteries. These feudal lords in turn permitted colonists to settle, either making them proprietors of the land cleared by them—the using of the products in special parts of it included—or granting them the rights of *usufruct* in their own forests.

The latter was especially true in Southern Germany and in the Slavic regions in the East, which had been conquered after 900 A.D. In these parts of the country the use of litter, pasture, firewood, resin, and grass land,—increasing more and more during the course of the centuries and later-on called “Servitude” according to the Roman Law—did much damage to the forests, until these rights of use were annulled during the first half of the nineteenth century.

It is true that the use of wood during this first period was quite natural, for almost all objects of daily life, such as spoons, dishes, barrels, wheels, houses, ships, and wagons. The number of people, however, was still comparatively small, so that the forest and its resources were less endangered by the population meeting their demands of wood, than by their want of pastures for their cattle and soil for their very extensive farming. The first uses were the wild-bee-keeping, the fattening of pigs (mast), the grazing in the forests, and hunting.

With reference to II : **From the Saxon Emperors to the End of the Middle Ages :**

By conquests of land and confiscations, after the end of the Carolingian dynasty, the private property of the kings still increased so much that they were not able to master it by their own administration, the so-called “Maierhof-Legislation” (Villikation). So they tried to get rid of their private property. The enfeoffment with landed property, which by and by became feudal tenure by heritage, was added to the donations given to churches, monasteries, and feudal lords. Moreover, the kings, when running into debt because of wars or their increasing household requirements, gave crown-lands as a security and then failed to meet their obligations. Thus, at this time, the large domains owned by feudal lords or by the clergy came into being on different legal bases : by restriction and usurpation of the free co-operative communities and their being changed into manorial co-operative communities : by donation ; by enfeoffment ; or by the kings’ indebtedness to creditors. Forest property was also bestowed upon newly established towns, as in many cases the policy of the kings during the early Middle Ages was not based on the aristocracy, but on the towns.

During this long period of six hundred years, the yield of the forest almost exclusively consisted of natural products. The proprietor of the forest was often glad, if he was paid rent for permitting mast and grazing, and bee pastures, and if this rent was given to him in the form of natural products, such as corn, wine, or small domestic animals, for instance, poultry. It was not till the last centuries of the Middle Ages that a partial change towards the monetary system took place. As late

as 1200, a tithe ("decima") was paid for the mast of swine and money for stumpage and for the assignment of trunks.

Nevertheless, in this period only the beginnings of regulated forestry, namely the forests owned by towns, can be seen.

During the twelfth and thirteenth centuries they began to demarcate certain districts of forest, and to forbid any use of wood and pasture in order to give them a chance of reproducing naturally. At those times the deciduous forest was prevailing in large parts of Germany, because of its granting the greatest yield of mast, pasture, game, and firewood. Its strong tendency towards sprouting offered the simplest solution of the problem of re-afforestation. So, already in the fourteenth century, the use of deciduous forests was regulated according to supply and demand by a proportional dividing of the area in respect of the number of years of rotation; for instance, in Central Germany, at Erfurt, in the year 1359. In addition to this, the kings issued orders of re-afforestation, and, for the first time in the year 1368, in the Nuremberg Reichsforest pine-trees were sown artificially. The consequence of this was the foundation of a real guild of pine-sowers at Nuremberg and Frankfort-on-the-Main.

For the criminal law in the realm of forestry, the old "rights of the people" (*leges barbarorum*) were still in power, until they were replaced by the local-community-laws ("Weistümer") within the range of the still existing common forests. What was allowed and what was forbidden were laid down for each forest by these laws called precedents. The penalties for offence against the forest- and game-laws and for poaching were often very severe and ranged up to capital punishment, which, however, was seldom carried out. Up to modern times the opinion was held that the purloining of unpiled forest products during daytime was no real theft and that it had to be punished less severely.

Up to the end of the Middle Ages the literature of forestry was very poor and almost completely supplied by the Roman literature of agriculture, by Ovid, by Marcus Publius Cato, and others. The only work of greater importance was that of Petrus de Crescentiis, senator of Bologna, which is based on Aristotle and the natural science of the Arabians, written about 1300 and first printed in Germany in 1471.

With reference to III: **From the Beginning of Modern Time to the Middle of the Eighteenth Century (1500 to 1750).** The mightier feudal lords, who later became sovereigns of the countries, and the minor feudal lords temporal and spiritual, under their protection and in alliance with them, took advantage of the decline of the German Empire on the one hand, and of the co-operative village communities on the other. In respect of their forests, the sovereignty of the lords—who were directly subject to the old Empire—increased, and more and more encroached upon the rights of private persons. This development finally reached its climax in the despotic police-state of the eighteenth century, which had emancipated itself from the power

of the Emperor and of the Empire. Many of the still-existing village communities disintegrated, too, and the land was distributed among the former co-operators. In this way they hoped to escape from the ever increasing encroachments on the common forests, and to be under less control as private forest owners. In still existing co-operative communities the chief co-operator, that is, the feudal lord, or in the case of larger communities, the sovereign of provinces or countries, participated in the yield by a third or a half.

Since the forest products remained highly vital to the population, the rights of use of the forests, which no longer were owned by them, were officially granted them now. Thus they were given a substitute for their former rights of the use of the common forests. Their financial reimbursement, however, became so small by the increasing depreciation of money that it was only a fee of acknowledgement. With respect to the user, the legal position of the feudal lord was only strengthened. (On the other hand the feudal lords often sank into poverty and became robber-knights.) It was only by and by that the servitudes proved to be such a hindrance to silviculture that, from the sixteenth century on, attempts were made to change their status again, namely, by pecuniary compensation and transfer of land. Thus, on the same area, the feudal property, which formerly had been common property, (the "Mark"), became the private farmers' or the communities' forest property (property of the political community).

Though the period of the clearings of the forests had come to an end in general, colonists still settled in remote parts of forests and clearings, for instance, in Lithuania and in the Alps, about 1800. Unclaimed forests were sequestered by the sovereigns of the countries (no longer the German kings as in former times). Apart from small remainders, in the course of time, these forests of the sovereigns came into the possession of the state, its last remainders as a consequence of the revolution of 1918.

Wherever the density of population increased, and trade was possible owing to waterways and old man-made highways, especially of course, in Southern and Western Germany, already at a very early time, silvicultural measures were prescribed. These modern regulations now took the places of the former precedents ("Weistümer") and local forest ordinances. These regulations differed from the old ones by a wider purview—the country, the province—and by their being more detailed. The first forest regulation of this kind originated in Wurtemberg and was issued in 1492, the year of the discovery of America. The last forest laws, however, were published in 1830, eighty years after the end of the period we have been dealing with.

First and foremost, the purpose of these forest-regulations was to diminish the impending or imaginary shortage of wood; and that was in accordance with the spirit of mercantilism, which demanded the concentration of available funds in the country for supplying the wants of the people, and postulated high inland revenues for paying the stand-

ing army. That was not only a matter of national interest; it also rose from the sovereign's care for his subjects, who still were dependent on the raw produce of wood. Above all, the forest-regulations accordingly included measures for economising wood and, in later centuries, frequently stimulated the further development of forestry in silviculture and in the arrangement of output. The first and most important orders given in this context, were those checking the rapid spread of the noxious goat-pasture for example.

When I speak about the importance of wood as providing people of that age with raw material during their whole life-time, I don't mean to say that the so-called secondary yield lost in importance between 1500 and 1750. After the end of the Thirty Years' War, that is after 1650, there was a rapid increase of inhabitants in Germany. They were still a rural population depending on their cattle, on honey and on iron for their tools. Thus they used the grass in the wood, the beech-nuts and acorns for feeding their swine (for there were no potatoes at that time). Furthermore, they used honey instead of sugar, charcoal for hammering iron, resin for burning-tar and oak-bark for tanning leather-skins. In this context, I must not forget to mention the growth of luxury at the courts and the keeping of large game stands as red deer and wild boars. In the 17th century, hunting absolutely prevailed against forestry; but the interest in silviculture had at least contributed to guard the woods against the trespassing of unauthorized persons and to preserve hard-wood for some further centuries. Yet the preference for hunting, on the other hand, contributed to diminish the reputation of the forest-keepers who were badly paid, whereas the hunters were highly esteemed. The large game stands were disadvantageous to re-afforestation and to the peasantry whose fields were devastated by the game.

Charged with that extensive burden, forest seeding could only develop very slowly under strong set-backs. The first beginnings of this development may be traced back even to the Middle Ages. At the close of the 16th century the cultivation of sprout forest already began developing into cultivation of coppice with standards. It was even as early as the middle of the 16th century that a certain system of felling areas existed, that is, felling areas ranged in one line. There was also a sort of group-cutting at that time, that is, a natural regeneration on small areas which, to-day, we would call "a group selection system". Nurseries and seeding of oaks were generally known in the 16th century. In the early years of this century, which, in Germany was very prosperous and furthered the wealth of her towns, people were familiar even with the practice of thinning. But a regular practice of re-generation with beech—the most important species of wood besides the oak—set in only at the beginning of the 18th century, after the Thirty Years' War had spoiled many promising beginnings of German silviculture and reduced her population to some few millions of inhabitants.

Little interest was taken in the cultivation of coniferous trees, which

—where conifers occurred most frequently—were even confined to some remote forest areas, though the pine-tree was the first species of conifer to be planted in the 14th century. The large felling areas, cleared by charcoal burning for the production of iron, were restocked by nature, although, in the 16th century, Scots pine was raised through artificial seeding in Northern Germany. The first attempt of artificial seeding of pine-trees in the Hartz-Mountains failed about 1680 and were not carried out more successfully before 1720. About 1750 the planting of spruce spread over to the west of its original border of Lower Saxony, and the *larch-tree* was introduced all over the country. The first American tree-species was introduced in Europe as early as 1536 (*Pinus strobus* came to Germany by way of England in 1705), but it was not before 1827 that the Douglas-fir was planted for the first time.

The *forest planning* may be also traced back to the late Middle Ages. As the division in the lay-out of square-miles was possible only in little woods, it was from the 16th century (about 1550) onwards, that another principle was established, which on the contrary made the arrangement according to cubic feet, and the increment that was to be expected for a hundred or two hundred years. *The first plannings* at the time were founded in Austria and Central Germany. At the same time, these forest plans provided an opportunity of supervising and of promoting the forest-state-authority. This opportunity was welcome to the mercantile state. At the beginning forest regulations were still given with the co-operation of the corporation of the landed gentry, who, later on, lost this right with only few exceptions. It was primarily in Southern and Western Germany that, since the end of the 17th century, private silviculture was largely controlled, yet this control was only exercised for communal forests and paysant-forests, though the feudal lord of a forest was personally instructed to control the forests of his subjects.

The High Catholic Clergy and the towns held a social position equal to that of the nobility. The former gave themselves forest-regulations, which were signed by territorial princes and the execution of which was under careful control. Everywhere the employment was prescribed, yet the degree of education of these foresters varied very much. Up to the 18th century they often came from the lowest social classes and were hardly able to read or write.

Literature:

Before the beginning of the 18th century, there actually existed no more than two important works about forestry: One of them was written by Johann Colerus in 1600. It belonged to that sort of literature which was to be found in everybody's home, as the Bible was. There everything that was useful to the household, including information about sowing and planting trees, was to be found. The second work of importance, I mentioned before, was that of Noe Meurer, a lawyer to whom we owe the texts of many forest-regulations. In the 18th century,

there were two types of self-made-man in forestry—there was no academic knowledge of forestry at that time:—(1) The so-called "hunters of the nobility", at the head of which stood the Saxon County-mining-official, Hans Carl von Carlowitz with his important work "*Sylvicultura oeconomica*"—which deals with forestry only, not with hunting; and (2) the so called "hunters versed in forest-knowledge" or "literary foresters".

Two remarkable characters of this group were Henry Wilhelm Döbel, the author of "Hunting-Practice" and Johann Gottlieb Beckmann, a passionate and great advocate of clear felling in coniferous forests and of artificial regeneration by seed and also a passionate opponent of the selection forest.

At that time, selection-felling was not yet an economic system, based on forest-scientific planning as it is to-day, but simply an arbitrary cutting-down of various stems according to their usefulness and without any consideration for silviculture; that is why this method, for good reasons, became more and more obnoxious.

Modern history of forestry since the middle of the 18th century.

The *development of land-ownership* was influenced by great transformations. In various regions of Germany, where the dynasties had changed over to the Protestant Faith, the ecclesiastical estate suffered serious *losses* by the Reformation. This process of secularisation was brought to an end by a *resolution taken by the Imperial German Parliament in 1803*. According to that resolution the ecclesiastical lands still existing fell to the secular territorial sovereigns.

Their ownership of the newly acquired estate was not unchallenged during the following year. Part of it passed to the state property as early as the 18th century, as happened in Prussia for example; another part was ceded to the state, when Germany became a Republic in 1918. The rest of their private property of woods was confiscated according to the act of expropriation of 1945 in the Soviet-Zone and fell in Western Germany within the scope of the land-reform, which, contrary to the conditions of the Soviet-Zone, were much more indulgent. The constant growth of the state-forest, was to some extent checked by the deprivation after 1820, when the government was obliged to give forest-land in exchange for forest-liberty. Germany, however, was not troubled with the wholesale trade of state-property owing to the theory of free-trade as established by Adam Smith-Austra, on the contrary, two and a half millions acres of woodland was sold to private owners.

In 1937 the private forest in Germany to the extent of nearly half of the total forest area was preserved partly in large, partly in middle-sized and small forest possessions. *The communal property* and that of public bodies, which survived from those of former march-associations and municipal-wood-owners, still amount to approximately one-third of the wood area.

The conditions of the German woods, which at the close of the Middle Ages, were passably satisfying, gradually changed for the worse through the increasing demands of factories and industries as well as through wars and the rapid growth of the population who still procured their necessities of life from the woods.

About 1800 the forests were in a *very bad condition*—unknown till then. It was since the middle of the 18th century that some prominent characters set to improve them, and thus saved the wood from destruction. These men of whom Germany has been proud even up to the present time were *Georg Ludwig Hartig*, who was the manager of the Prussian state-forest-administration from 1811 to 1837 and acted as teacher of forestry for half a century, *Heinrich Cotta*, manager of the school of forestry of Tharandt in Saxony from 1816 to 1844, *Johann Christian Hundeshagen*, a man of high intelligence, adherent of a speculative tendency of forest-science and creator of forest-statistics who taught in Hesse, especially at the University of Giessen in the first three decades of the 19th century, and *Gottlob Koenig*, who, at the same time, established a forest-trade school in Thuringia and made his mark in the field of forest-mathematics, and Friedrich Wilhelm Leopold Pfeil, combatant of the liberation wars against Napoleon, who, sometime later, was called to the school of forestry connected with the University of Berlin and was lecturer at the forest academy at Eberswalde in the north of Berlin from 1830 to the approach of his death.

The attempts to come to regulate conditions of the forest were of course accompanied by many failures and difficulties. *The German Liberation Wars of 1813* brought grave poverty and indebtedness upon Germany. On the other hand, German soldiers who joined in the American War of Independence conveyed knowledge of American wood-species. To Germany, that knowledge was expected to prevent the impending shortage of timber, but people were disappointed in their hopes. New impulses to the cultivation of exotic wood-species were given about 1880 by Chancellor Prince Bismarck and John Booth, owner of English nurseries, who met in Hamburg at that time.

The shortage of wood was to be met not only by the importation of exotic wood-species but also by the furthering of native and fast-growing deciduous species. In this context I think of the birch-mania "*Betulomania*" which, like the clear felling, had been furthered by the state already since the middle of the 18th century and nearly caused great damage because it was to transform the still existing high forests into bad sprout forests, fast-growing though they were. It was only in 1840 that the birch-mania was successfully brought under control after the shortage of timber had been removed by transport-inventions. But instead, another danger rose for the German forest. Its origin can be dated back to the middle of the 18th century, when, under the influence of Lord Minnigerode and, later, of *Georg Ludwig Hartig*, beech cultivation was put into a system which regulated forest operations. This system was the so-called *method of shelter-wood-felling* that was not

exactly the same as clear cutting but also marked the woods with the stamp of uniformity which was very dangerous and, above all, superseded all useful supplementary tree-species such as the oak for example.

Since the last change of climate, the German wood has been essentially a *mixed forest*; the misuse in cutting, however, altered the character of the forest. About 1800, people set to re-afforest the devastated woods, but that could be done only with the coniferous species that is with the pine and the spruce. Scientific training in habitat and forest soil was absolutely unknown at that time. In the middle of the 19th century, however, people didn't content themselves with merely afforesting run-down and devastated forest areas but they first applied *formulas*, the so-called "soil rent theory".

According to this theory the structure of the forest was constructively planned and not left to the laws of nature, habitat, plant-sociology and forest-geography. From this theory rose the notorious monoculture of pine and spruce which, to an increasing extent superseded the native and soil-fostering tree species such as oak, the beech and the fir and brought about much danger of storm, snow-drift, forest fire and insects. The reaction of the overstated theory which I mentioned before, was often spoken of as a "Boomerang reaction"; that metaphorically means that the wooden missile which was to serve for the increase of rent, returned and struck the forester down.

This development implied not an increase but a decrease of rent.

After all, we must recognize the good will of the 18th century to afforest part of the devastated woods and we even must recognize some temporary success which permit us to-day to transform the woods according to organic and biological principles so that they would survive crises of any kind. This process has not been concluded yet; we still are in the very heart of it.

The constructive work of the 19th century, the development of the theories of rent, forest organisation, silviculture and, finally, the re-establishment of laws which put an end to the transitory lawless conditions in forestry, provided standing crops amounting to many times more than what had been in existence about 1800.

Speaking of transitory lawlessness, I want to indicate that private forest culture was almost free throughout the 19th century and that consequently the capacity of the small forest property was more and more on the decline though, in most cases, it had already changed into tillage. The middle-sized and large private woods were preserved from devastation by tradition and by responsibility to the family and to the state. The state forest was cultivated according to approved conservation principles, though, frequently, it made people contrive rigid systems. The communal and corporation-forest preserved the strict *state control* which had developed from forest authorities of the sovereignty and gave it an active power for the following years. The state control never ceased to exist, especially in Southern and Western Germany, where

the communal and corporation forests were widely spread but also in other regions of Germany.

During the recent fatal war the German forests which again and again had been troubled with disaster underwent the last crisis. Even at that time, the standing crops faded away and were exhausted still more seriously after the end of the war. In the Eastern Zone all private forest property of more than 100 hectare was expropriated without compensation and became state forest. Anyway, the standing crops of the Federal Republic to-day amount to almost one thousand million cubic metres that is half of what the German Reich possessed in 1937. Compared with that year, the two zones together lost 22 per cent. of their forest areas. In 1950 the open areas not afforested ran to one million hectares in both zones. But with an immense impetus the Western Zone afforested three hundred thousand hectares of their open areas devastated by the war and is again about to carry their standing crops to a normal extent. The wood prices which had gradually become adapted to international standards, also contributed to secure the profitability of the forest-property. Now a fundamental change in the forest is being felt. Thus the use of all kinds of timber begins to extend upon the use of high quality timber; by degrees the consumption of wood gives place to the consumption of substitutes. But after all, there is no reason to fear a crisis in the German silviculture in view of the increasing density of population of the world and in view of the high demands of various assortments of timber as pulp wood, pit props and building timber.

Yet we want peace, as all people do, to stabilize our trade and industry and, with that, our silviculture, and we know that to-day a war would imply not only the destruction of the woods but also the ruin of all people.

The following statement has been supplied by the Forestry Division in regard to the recent announcement of an increase in the grant for private planting.

Private Planting.

Increase in the Amount of State Grant.

(1) The amount of the Grant which may be paid by the Minister for Lands towards the cost of the planting (or replanting) of land by private landholders or public bodies *has been increased to £20 per statute acre with effect from the commencement of the 1958/59 planting season.*

(2) The Grant is payable in two equal instalments as follows :—

£10 per statute acre on the satisfactory establishment of the plantation, and

£10 per statute acre five years after payment of the first instalment.

(3) The following conditions apply :—

- (a) The total area to be planted must be not less than one statute acre.
- (b) No area of less than half an acre will be taken into account in the calculation of the amount of Grant payable.
- (c) Save in exceptional circumstances the width of any plantation must be not less than two chains (44 yards).
- (d) The trees planted must be suitable species of forest trees as approved by the Minister.
- (e) An adequate number of trees at suitable spacings must be used. The following species may be planted at not more than six feet apart when planted pure or in intimate mixture with one another :—Sitka spruce, Douglas fir, Japanese larch, *Pinus insignis*, *Cupressus lawsoniana*, *Cupressus macrocarpa*, *Abies nobilis*, *Abies grandis* and ash. Except in special circumstances and subject to the Minister's approval other species should be planted at not more than five feet apart.

At six foot spacings approximately 1,250 trees per statute acre would be required; at five-foot spacings the number required would be approximately 1,750.

- (f) The plantation must be adequately fenced and protected, where necessary, against damage by fire, livestock, rabbits, etc.

(4) Payment of the second instalment of the Grant may be withheld if the plantation has not been properly maintained after establishment.

(5) A Grant will not be paid in respect of any planting or re-planting for which a Grant is payable under any other State scheme or for which trees are provided at the public expense either free or at reduced rates.

(6) Application for Grants under the scheme should be addressed to the Secretary, Department of Lands (Forestry Division), 22 Upper Merrion Street, Dublin.

N.B. The services of the Department's technical officers are made freely available to advise on methods of planting, suitable species, spacing, etc. If you have land suitable for planting you are invited to avail of this facility.

Sixteenth Annual General Meeting.

THE sixteenth Annual General Meeting of the Society was held in the Shelbourne Hotel, Dublin, on Saturday, 15th March, 1958.

The private meeting was opened by the outgoing President, Mr. O. V. Mooney. There was a very small attendance of members at this stage.

The minutes of the previous Annual General Meeting, having been published in Vol. XIV, No. 1, "Irish Forestry", were taken as read.

The Secretary then read the Council's Report for 1957.

Council's Report

THE new Council met on 22nd January, 1957, at 85 Harcourt Street, Dublin. There were seven members present. Mr. O. V. Mooney, President, welcomed the new members and expressed his thanks to the members of the previous Council for their co-operation during the past year.

The following Committees were appointed:—Editorial, to arrange the issues of the Journal; Finance, to deal with the question of expenditure, etc.; Excursion, to organise the Annual Study Tour and local excursions. Committees were also appointed to deal with Membership and the Constitution.

The meeting made preliminary arrangements for the Annual General Meeting.

It was decided to hold the Annual Study Tour in the Limerick Area from the 3rd to 6th June, 1957. A programme of Day Excursions was drawn up to include the following venues:—Deerpark, Blessington, Knockrath, Rathdrum, Portlaoighs, Clonmel, Mallow and Sligo.

The Council met again on Tuesday, 19th February, 1957, when final arrangements were made for the Annual General Meeting. Seven members were present.

A Meeting of the Council was held on 25th June, 1957 when eight members were present. The suggestion made at the Annual General Meeting that some of the funds of the Society should be invested in a plantation was considered and it was decided that this would not be a practical proposition with the money available. Reports were received from the Editorial and Excursion Committees.

A Meeting of the Council was held on 24th September, 1957 when six members were present. The report of the Excursion Committee was received and the best thanks of the Council were extended to Mr. McNamara for the success of the Annual Study Tour.

A Meeting of the Council was held on 12th November, 1957 at which nine members were present. The meeting considered a letter from the Minister for Lands intimating that he would receive a deputation from the Society in the third week in November. The following

were appointed to represent the Council at this meeting: Mr. O. V. Mooney, President; Mr. D. Mangan, Vice-President; Mr. T. Clear, Secretary; Mr. M. Sharkey and Mr. M. J. Cosgrave.

The meeting noted the nominations received for the election of Officers and Council and arrangements were made for a ballot where necessary.

The final meeting of the Council for 1957 was held on Tuesday, 3rd December, 1957 when five members were present. The Secretary reported on the meeting with the Minister for Lands, held on 28th November, 1957 and it was agreed that a full report should be prepared by the members of the deputation. The Report of the Editorial Committee recommended that the price of the Journal be increased to 5/- per copy and this was approved by the Council. The meeting decided to recommend to the Annual General Meeting certain alterations in the Constitution.

MEMBERSHIP: The Statement of Accounts show that paid up members on the 31st December, 1956 were:—
Grade 1, 45; Grade II, 67 and Associate 85.

JOURNAL: Two issues of the Journal appeared during the year.

The Adoption of the Council's Report and the Financial Statement was proposed by Mr. Chisholm and seconded by Mr. F. P. Clarke and was carried unanimously.

The members at the meeting then stood in silence as a mark of respect to the memory of Mr. John O'Leary.

After Mr. Mooney had given his valedictory address, Mr. Mangan, the new President, paid a warm tribute to the work of Mr. Mooney and said that the Society had reached new heights under his able leadership. He (Mr. Mangan) hoped he would be equally successful.

The results of the Ballot for the new Council were announced and the election was confirmed by the meeting. The programme of excursions for 1958 was then outlined.

Mr. Mangan then called on Mr. McEvoy to explain the changes in the Constitution proposed by the Council. The meeting adopted by a two-thirds majority the changes proposed in relation to Article V and Article VI. After some discussion the resolution proposing changes in Article VIII was withdrawn.

President's Address

THOUGH no phenomenal event such as the great storm of January 31st and February 4th, 1957 occurred since our last Annual General Meeting, it seems to me that there have been a number of important happenings and portents which have widened, brightened, and warmed, the forestry horizon more significantly than has been the case for many years.

State Forestry.

In the sphere of State Forestry we had earlier in the year the setting up of a Research and Assessment section. Irish foresters have felt for many years that they had young forests which were at least the equal in quality and interest of those in Great Britain, but they have sorely felt the need for organized and scientific interpretation of results—whether of success or failure—and consequently the coming of research is a welcome and really great thing for Irish Forestry.

The tackling of the assessment problem—a vital step to proper scientific management in any forestry service—suggests besides that the industrial potential of our forests is now appreciated by the powers that be. The initiation too of Time and Motion Studies in respect of the work in our forests is something to be welcomed also as a proper appreciation of the economics of the work. From this approach much good should flow not only to the morale of the men who work in the forest, but also in regard to the upgrading of the output from their efforts which will, we hope, be accompanied by a maintenance of a high standard of quality in the various operations.

The routine look that we usually take at the figures from State Forest activities during the year suggests also a brighter outlook. The 1956-57 planting season concluded with an area of 17,407 acres having been planted and the moderate climatic conditions of this winter suggest that the provisional programme for 1957-58 of 20,000 acres will be achieved; this will give us the biggest area planted in any single year so far. The figures for 1956-57 for the more important species show S.S. at 40%; P.C. at 31%; N.S. at 9.5% and hardwoods at 3.8% of the total number planted. The total area planted to date now stands at 247,000 acres.

The land acquired in 1956-57 was 18,731 acres of which some 2,646 acres was unplantable.

It is probable that something in the region of 25,000 acres of land will be acquired by the end of March this year which would bring the total forest holding up to 364,024 acres or thereabouts.

Forest Produce sold in 1956-57 brought in £229,634. It comprised 3,118,243 cubic feet of material under 8" Q.Q.B.H. and 738,976 cubic feet over 8"; other produce sold included 43,944 Christmas trees.

Sawmills receipts accounted for £29,170 giving a total receipts figure of £258,804.

The final estimate of the volume of trees blown down by the gales of January and February 1957 was 3,000,000 cubic feet.

This premature arrival on the general market of some heavy and mostly medium and small sized produce did not depress prices for raw material as might have been expected but, if anything, raised prices a little. It had also the effect of stimulating the home market and the home timber merchants were able to meet the expansion of trade in a very capable manner. In fact one gets the old feeling again—that of

regret that planting on a big scale had not been carried out in the twenties and earlier so that this sudden impetus, so well responded to in the open market, could be maintained as routine successional fellings in the years immediately in front of us.

As a forester I hesitate to say that the storm might be regarded as a blessing in disguise by reason of its premature stimulation of greater real interest in the business world in the produce of the forest. But it seems to be quite clear that industrialists have now gone past the stage of estimating the technical capabilities of our forests whether for timber or pulp, and are at the moment mostly concerned with how much our forests can give.

Nobody has as yet attempted to write up this famous storm, assess its silvicultural implication, but on their Study Tour last year members had ample opportunities to see the type of damage done.

Reports from F.A.O.

F.A.O. of U.N.O. of which this country is a member Government, has much of interest to us in *European Forestry Commission, 9th Session, May 1957.*

They refer in their review of the National Progress Reports on Forestry to the efforts of member Governments being directed more and more towards "Afforestation, at least in the countries of central and southern Europe, considerable areas being planted to poplars."

"The promotion in nearly all countries of the private small woodland" and, more generally towards the integration of Private Forestry in their national economies.

"Increased productivity by increased efficiency in logging operations and by setting up of new factories to absorb these forest products that have until now been more or less discarded by industry."

They also draw attention in their report as a matter of primary importance to the "control of the origin and quality of *forest seed and planting stock*" and it was stated that "this control was being pursued or initiated in several countries in several ways." This whole question is being given "due consideration not only by science but also by practice, and relevant legislative measures are being taken in a number of countries."

"Consequently the commission recommended that the Director General should draw the attention of member Governments to the great importance of an efficient control of the origin and quality of forest seed and planting stock, to avoid serious mistakes in establishing new forests and in particular, should urge those governments which at present have no such control to take appropriate measures as soon as possible to remedy the situation."

The Commission also reported that European Governments recognised the great advantage for farmers to have small woodlots closely linked to the farm economy and they thought that if fruitful results

were to emerge that agricultural and forest development would have to go hand in hand and not be planned separately.

It was recorded too that Myxomatosis which had so greatly helped forestry in recent years was now declining sharply in virulence. We here in Ireland know this and all foresters are fully aware that rabbits are on the increase and are spreading from the uninfected areas and are to be seen in numbers in their old haunts. If we just stand and watch this repopulation we will soon find ourselves in a position of having lost all the valuable benefits brought to us by Myxomatosis.

The Editorial in Irish Forestry Vol. XIV. No. 1 Summer 1957 deals very fully with the dangers of the returning rabbit and shows how opportunity to combat the danger may well slip through our fingers. The matter is, of course, not only of forestry, but of country-wide and national importance. In the fields of entomology the Commission while very much interested in the virus control of insects do not hand out any short cuts to general insect control that might affect us here. They say in fact that "Chemical control methods of forest insect pests are exceedingly expensive and effects of insecticides used on other animal species are not yet known for sure."

The F.A.O. World Market Review to 31st August, 1957 and the *Yearbook of Forest Products Statistics 1957* indicate that the steady upward trend during the post war period of roundwood removals has been maintained (1956, 1,583 million cu.m.) but estimated world prices for sawwood, plywood, pitprops and other industrial woods showed slight reduction from 1955 to 56. There is, however, an increase in the total value of wood pulp.

"Exports of wood products, expressed in roundwood equivalents decreased from 1955 record level of 159 million cu.m. to 155 million cu.m. Reduced exports were reported from all the main exporting regions, and increases were only noted from Africa, Asia and the Pacific area.

"Once again sawn wood output declined slightly in 1956 from 296 million cu.m. to 295 million cu. m. The Plywood industry did not maintain its previous steep rising trends in 1956 and only rose from 10.7 million cu.m. to 11.3 million cu.m.—only a slight increase.

"On the other hand pulp wood output continued to rise and production came from 46 million tons to 49.0 million tons—a record figure. The largest individual increases are Japan 15%, France 9%, Italy 8%, with North America and Europe the largest producers.

"Fibreboard also reached a new high level of 3.34 million tons in 1956, while paper, newsprint and paper board showed corresponding increases.

"Pulpwood production rose 9% in 1955 but consumption kept ahead of production and rose 11%. Trade increase over 1946 figures was nearly 100%. With literacy and world population increasing the outlook is a bright one in the pulpwood field."

The F.A.O. Report of The European Market brings us much nearer to the present time than in the similar *World Review*—understandably so.

They indicate that the volume of sawn softwood imports by countries in Europe during 1957 amounted to one quarter of a million standards more than in 1956, imports of pulpwood remained unchanged and plywood imports showed a decline. They say, too, that although the total volume of trade in 1957 seems to amount to more than in 1956 and the total consumption of wood in Europe during 1957 is also likely to exceed somewhat the 1956 level, the year 1957 cannot be regarded as an altogether satisfactory one for the European timber trade.

And they conclude their Report with the following sobering paragraphs.

"Europe's timber trade, particularly that in sawnwood, which during the past two or even three years has seen profit margins narrowing or even disappearing, and which, particularly in the course of the current year, has seen additional difficulties emerge in the form of dearer money and financial restrictions, faces 1958 with perhaps more uncertainty than was the case at the beginning of previous campaigns.

"Despite the growing marketing difficulties caused by rigidity of resale prices as against the rising tendency of production costs and export prices, the increasing total consumption of sawnwood in Europe has nevertheless made it possible in many cases to find in a larger turnover compensation for smaller unit profits.

"There is no doubt that the small but steady increase in the total consumption of sawnwood during recent years has been caused by the continuous expansion of industrial and economic activities in practically every country in Europe.

"In fact Europe's total industrial activity increased by some 10% in 1955 and about 5% in 1956. By the end of the first half of 1956, however, the expansion had begun to slow down and during the first three-quarters of 1957 was at a rate of less than 2%. Thus, with the principal incentive for maintaining or even slightly increasing demand disappearing Europe's total consumption of sawnwood in 1958 might well, for the first time since the war, show a decline.

"It seems clear also that in such conditions buyers and consumers will be even less prepared to pay higher prices than before."

B.A. Meeting in Dublin.

An outstanding event of the year not only for forestry but for all the other sciences and for Dublin was the meeting in this City of the British Association for Advancement of Science in September last.

The Forestry Sub-Section met under the Chairmanship of Mr. McEvoy and the local Secretaryship of Mr. Clear. The occasion provided Foresters and others interested in forestry here with the oppor-

tunity of meeting many notabilities from abroad including a particularly strong contingent from the B.F.C. Research Section lead by Mr. Laurie.

The Forestry Division of the Department of Lands staged an exhibit in the College of Science entitled "Fifty Years of Irish Forestry" which by photograph, graphical illustration and specimen demonstration illustrated many facets of Irish Forestry, high lighting in particular the history, performance and utilisation of *Pinus contorta* and Sitka spruce, our two most important planting species. The Department also entertained the Members at Shelton Forestry School and conducted them on visits to Avondale, Glenealy and Delgany Forests. Considerable notice was taken by the visitors of the exceptionally high yielding *Eucalyptus* stands at Glenealy and of the fine 53 year old stand of *Tsuga heterophylla* at Avondale.

A visit was also made to that very remarkable pinetum at Powerscourt which I fear is not at all well enough known to Irish Foresters.

The members spent also very instructive afternoons at Clondalkin Paper Mills and at the mills of Irish Timber Industries Ltd.

Apart from the Chairman's address on "Forestry in Ireland" we had papers directly relating to Forestry.

"Afforestation of Peat Lands in Northern Ireland."

K. F. Parkin.

"Ecological problems arising in afforestation of peat land in Northern Ireland."

R. E. Parker.

"Yield Regulations and forecasts of production."

Dr. F. C. Hummel.

"Some experiences in Survey and Assessment of growing stock for Forest Management purposes."

T. Clear.

"Economics in Forest Management."

W. E. Hiley.

"Roads for economic timber extraction."

E. R. Huggard.

The benefits to all taking part, both from discussion and papers indoors and in the Forests, and from personal contacts made with foresters from other parts of the world were of the greatest importance.

Fortunately the members of our Society can benefit also as most of the papers read at the meeting will be published in the next and succeeding journals.

Publications.

Last year I attempted by brief reference to draw attention to the more useful publications brought out by F.A.O. but as it is impossible to keep fully in touch I will not repeat the attempt this year.

There has been, however, one publication which should have a general appeal and be of great practical aid to any forester or anyone interested in trees. It is *Forestry Commission Bulletin No. 30. "Exotic Forest Trees in Great Britain."* H.M. Stationery Office, 17/6. This is

not a booklet on forest botany but it deals with practically every imaginable exotic including the common silver fir (*Abies alba*), Norway spruce, Sitka spruce and so on to such interesting species as *Cupressocyparis Leylandii* and *Nothofagus* species in a most detailed way under an exhaustive number of heads, e.g. Country of Origin, Historical Notes, Extent of Planting, Climatic Requirements, Site Requirements, Establishment Technique, Tending and Thinning, Other Silvicultural Characteristics, Rate of Growth, Yield, Diseases and Pests, Other forms of Damage, Seed and Seed bearing, Genetics and Breeding, Natural Regeneration, Timber, Potentialities in National Economy.

All this information together with eight Climatological maps covering these Islands and dealing with matters from rainfall to wind velocity, as well as some fine photographs make this book superior to all other works on the subject for everyday general information on the species used in our forestry work here. It must certainly enrich any forester's knowledge and provide him with a wide and safe reference. The Editors are James McDonald, R. F. Wood, M. V. Edwards and J. R. Aldous.

Society Affairs.

Looking back on our own year I hope that we may regard it as quietly successful. After our visit to Germany some may have thought that our Study Tour to Limerick and Co. Clare would be an anticlimax. We were, therefore, very pleased indeed to have 45 members, which is well up to average for any outing, and I think they all went home well satisfied due to the competent handling of the tour by a capable and imaginative excursion committee.

Our activities later in the year may have been overshadowed by the British Association Meeting and perhaps to some extent they may have drawn the fire of some of our Council members but we had nevertheless some very informative Sunday outings.

I would like to commend the Editor and the Business Editor for much work and considerable achievement and again, as last year, offer sincere thanks to our Secretary and a lively and hardworking Council.

Finally, in demitting office in a formal way now, I would like to thank you for the honour you have done me in keeping me as President for two years and wish our new President, Mr. Mangan, every success in his term of office, which I know he will have because he is well fitted for the task. It is already evident by his keen active approach to affairs during the few weeks that he has been acting in office that Mr. Mangan will do justice to his stewardship and with his undoubted popularity among all members a good year lies ahead for the Society.

The private business of the meeting having been concluded the President called on Dr. Axel S. Sabroe to read his paper on "Danish and Irish Forestry Compared" the text of which appears elsewhere in this issue.

Discussion on Dr. Sabroe's Paper

Mr. T. O'Brien, Secretary, Department of Lands, in proposing a vote of thanks to Dr. Sabroe said :—

"I welcome the opportunity of proposing a vote of thanks to Dr. Sabroe. It is very satisfying indeed to have here with us a distinguished and acknowledged forestry expert in the person of Dr. Sabroe. It is an honour and a privilege which I have no doubt this Society appreciates and we have been very fortunate in securing him. Here in Ireland we are most willing to learn about the best forestry practices and working plans—it is no harm to be eclectic or to borrow from the best doctrines we can find elsewhere and Dr. Sabroe, out of the abundance of his experience, is superbly qualified, as he has just demonstrated, to talk to us and enlighten us about the issues.

"In this country, if not elsewhere, forestry can be a very emotional subject. Among the various tastes in thought that exist about almost every worthwhile project there will be the inevitable extremes; in forestry, some group will be fetched by what I might call the merely sentimental or romantic side, seeing poetry in trees swaying in the wind or becoming 'heady' at the fall of Autumn leaves, while at the other end, one may encounter the hard-hitting critic who says in stiff prose 'these afforestation enthusiasts are overdoing it—if they were to get their way, whole sections of the country would be planted and to Hades with agricultural food. What do they expect us to do with the timber? Eat it! why, we would have to become a nation of wood-peckers.' The truth is that we can, of course, eat the worth of timber, for it is a very realisable commodity. The National Forest Authority will decline to get caught between the upper and lower jaws of the competing controversialists and will go about its own task which, in this country, is the establishment of an adequate forest estate; and the import figures for timber and timber derivatives show that there is quite a sizeable home market to be supplied.

"It is acknowledged and quite true that Ireland does possess some distinct advantages in tree-growth arising from rain-fall and climate generally. Nearly every variety of tree will grow much faster here than, say, in Scandanavia, and the production of a given yield of timber requires a much greater area of fully stocked forest in Northern Europe than in Ireland.

"In sum, the total area just now held by the Forestry Service of the Department of Lands is about 360,000 acres, of which 310,000 acres are plantable, and of that almost 260,000 acres have, in fact, been planted at 174 different Forest Centres throughout the country. Incidentally, over the last ten years 130,000 acres were planted; that includes the season just now ending in which the highest planting rate ever attained here will be recorded, i.e. 20,000 acres of new plantations are being laid down this season, so that it is now possible to say that

something more than half the total accomplished has been planted in the last decade. Apart from the State Forests, there are about 90,000 acres of woodlands in the hands of private owners.

"In the State Forests income is mounting and in the current year receipts from timber will be well in excess of a quarter million pounds. Dr. Sabroe has mentioned that during his previous visit in 1956 he learned that difficulty was being experienced in finding a market for Spruce thinnings. As you are all aware there has been a considerable improvement in outlets for the disposal of thinnings and Spruce in particular is one of our best sellers. We look forward confidently to further developments in the pulp field which will provide expanded markets for our thinnings.

"I said earlier that we were willing to learn and that is a mark of every progressive group but I can say this too—that as to the splendid quality of our existing plantations, there is on record in the Department very fine tributes from foreign experts. I interpret them as tributes to the knowledge and skill of our own Inspectors and Forester staff and it is an immense pleasure for me to say so for their worthiness deserves to be acknowledged. I think it was Samuel Johnson who said that the Irish people were the most honest he had found for the reason that they always think the worst of themselves. If country X has a sheep breed it is superb, if country Y has timber, it is wonderful: nearly always cited and mostly by ourselves as superior to ours. I don't accept that form of self-reproach or understating ourselves. Most of you know of the commonly held but unfounded belief that Irish timber is inferior to imported timber; in order to overcome this prejudice the Department set up sawmills and drying-kilns and produced native timber, properly treated and seasoned, of such quality as to demonstrate to and convince the public that native produce is equally good. Prejudice dies hard but a number of the enlightened timber merchants have added their weight and with their co-operation that struggle is beginning to be won. Forestry in Ireland is taking a big step forward and the Minister for Lands, under whose jurisdiction the Forestry Service comes, said in the Dáil about a fortnight ago that a greater area than ever before will be acquired for afforestation this year and that next year the planting programme will be expanded still further."

Captain Charles Tottenham of Ashford, Co. Wicklow, a private estate owner, in supporting the vote of thanks told of a 2,000 acre private estate in North Jutland which he visited in 1956. The estate was purely a forestry one with no agricultural land and had been purchased as a going concern only 30 years ago. The owner's entire income came from the produce of his woods. In Denmark a man can live comfortably, bring up a family and provide employment for 15 men on 2,000 acres of woodland. He compared this with conditions in this country where, in most cases, estate woodlands were regarded by the owners simply as amenity and game covert, seldom as a source of

income. He mentioned that in Ireland we are accustomed to seeing acre upon acre of wasted land: *hills* covered with bracken, furze and heather where a few sheep struggle for existence; *hedges* between our fields and along our roadsides often anything between 10 and 20 feet thick; hundreds of acres of *undrained bog* where the only inhabitants are turf cutters and wild fowl. In Denmark, on the contrary, there does not appear to be a single square yard wasted and not only that but every square yard seems to be put to its fullest use. Captain Tottenham referred to the great kindness extended to him by the owner of the estate, Herr von Folsach, whose guest he was for a fortnight and gave interesting information on various aspects of the work carried out.

In referring to his own estate he mentioned that when he took over the running of his 500 acres of woodlands six years ago there were at that time about 130 acres of completely unproductive land under bracken and furze, 60 acres of unproductive indigenous oak, 50 acres of young conifers and 260 acres of over-mature timber. Through membership of the Society he met Mr. Thomas Clear who undertook to act as his consultant and who prepared a working plan for the estate. Mr. Clear and himself have since been working together in complete harmony.

His visit to Denmark, inspired by Mr. Clear, was the greatest encouragement he could possibly have had and now he was glad to say that the greater part of the unproductive woods were being gradually turned into vigorous young plantations and money has begun to be available to finance what was an extremely under-capitalised 800 acre farm—even the farm has started to pay he said.

In order to reduce costs he had decided to carry out most of his planting with the faster growing conifers at a spacing of 7 ft. by 7 ft. This spacing in Britain qualified for a planting grant and he wondered whether the same will apply in Ireland. He thought it would probably be difficult to convince the Forestry Division that this is good forestry. He had seen a Douglas fir plantation 20 years old planted at 7 ft. by 7 ft. and it looked to him more healthy than one of the same age planted at 5 ft. by 5 ft. He said that he firmly believed that there is a great future for the private woodlands of Ireland and that we could take a leaf out of Denmark's book and have our private and state forests both producing for the benefit of the country. The Society has done very good work in this direction by bringing the private foresters into contact with their government colleagues and he felt that the cordial relations between them in this Society could be extended further afield.

Mr. T. Ua Cearbhaill, Superintendent of the forestry school at Shelton Abbey, in speaking to the paper first referred to the achievements of the Danes in the field of agriculture and compared and contrasted them with what has been done in this country.

Turning to forestry he said :—

"From what Dr. Sabroe has said about Denmark's soil, low rainfall, low temperatures and constant high winds as compared with conditions here it would appear that we have all the advantages but the fact remains that they have all the forests (!) and I suggest that if Denmark had our advantages in regard to climate and soil variety, aspects and elevations that their forestry acreage would be on an even greater scale. Some doubts have been voiced as to the wisdom of our large-scale peat plantings but I would point out that 14% of Denmark's forests are on reclaimed heathland and dunes much of which was practically sterile and with hard pan underneath and I consider that our chances of success are not less than theirs. I understand that Denmark is now considering the possibility of draining 100,000 acres of lakes for land reclamation.

"Forestry in Denmark has been under systematic management for almost 150 years and so they have not got the pioneering difficulties which we must face. They are far ahead of us, naturally, in their silviculture and their forestry is now a paying proposition which fact is reflected in the amount of private forestry carried on there.

"Dr. Sabroe has informed us that more than half of Denmark's forestry is private forestry. This may have come as a surprise to many of our members in a country where the state is being expected to carry all the load of the establishment of forests. Here in Ireland we have an estimated 90,000 acres of private woodland—mostly first-class forest land capable of the higher yields but in very poor condition owing to its having been picked over time and again of its merchantable timber. These woodlands, properly managed, could be the finest woodlands in the country and certainly would not need a booster to grow the poorer quality pines but rather would grow hardwoods and the more profitable species from Western North America. With a propaganda campaign, an advisory service and some financial help these woods could add very considerably to the country's forestry stocks.

"Education is the path to all social and economic progress and the Danes possess what one might call a forest sense, or forest consciousness, and are blessed with a forest tradition. There, agriculture and forestry have their recognition as professions and the work of the agricultural scientist and the forester have been accorded an appreciation which, so far, has not been forthcoming here. Lately there has been a realization here of the importance of the pure agricultural scientist to the community but we still await similar recognition of the forester. On one point at least I believe we can compare favourably with Denmark in forestry and that is in our technical staff. If there are any idealists left in Ireland to-day they must surely be found in the technical forest service. The majority of these men took up forestry as a profession or career at a time when it was neither fashionable nor profitable to do so because they believed that here was something of a challenge—something of permanent benefit to the country and an opportunity to play a

man's part. I am not so naive as to suggest that a means of paying for the groceries was not also a consideration! Many of these men embarked in forestry when they could have easily chosen a more lucrative profession and it is not by any accident that they are engaged in forestry work. I make this point to emphasise that the essential basic ingredient for the success of afforestation in Ireland is here as it is in Denmark—that is a keen, dedicated and efficient staff who realize that success or failure of the forestry programme will depend upon their initiative and efficiency in the field.

"We all have the highest admiration for the efficiency of the Danish foresters and for the depths of their silvicultural knowledge and we realize that knowledge of silviculture cannot be dispensed like pills in a box but must be acquired by study and experience. At a time when "get rich quick" methods are being advocated for forestry—despite the bitter experience of Saxony and Switzerland of transgressing sound silvicultural practice—it is refreshing to find the College of Forestry of the State University of New York choosing as the first publication of its proposed World Forestry Series the subject of "The Theory and Practice of Thinning" as expounded by Professor Carl Möller, the leading contemporary silviculturist in Scandinavia, and we note that this forester of international repute must never have heard of 'mechanical thinning.'

"I feel that Dr. Sabroe has been much too modest here to-night. He could, no doubt, have told us much more about his country's work on seed provenance, on tree-breeding and of the magnificent spirit of his country's foresters and their will to work.

"Perhaps, if, like Denmark, we had more private forestry we would all be better foresters and there would be more enterprise and less tendency towards the subjection of initiative inherent in any completely state-run concern.

"In conclusion may I say that it was a pleasure and an education to listen to Dr. Sabroe, a man who has left his own imprint on Danish forestry and whose book, *Forestry in Denmark*, published by the Danish Forestry Society tells so wonderfully well the story of his beloved forests and in relation to his paper may I quote for him from the Dean of the College of Forestry in Syracuse.

'Forestry in common with other human endeavours will flourish through applying the results of scientific research, through exchange of information and ideas and through vigorous trade in forest products. The more Societies exchange ideas and results the more fruitful their discoveries become and the more nations exchange raw materials and industrial products the greater the prosperity they enjoy.'

Fifteenth Annual Study Tour.

WEXFORD was the headquarters for the Fifteenth Annual Study Tour. Once again the Society was favoured by fine weather and a party of over thirty members enjoyed three days in very pleasant surroundings examining and discussing the problems of a wide range of State woodland properties from sanddunes at Curracloe through fertile estate woodland at Camolin to poor exposed moorland on Forth Mountain. In the evenings a room was reserved at White's Hotel where members relaxed in comfort and savoured (amongst other things) the art of conversation at its best.

The Study Tour will be remembered as a marked success especially in the interest of the technical discussions and in its instructional value, thanks largely to the excellent preparatory work of the Excursion Committee and the generous co-operation of the Forestry Division.

Tuesday, 3rd June, 1958.

Curracloe Forest.

The President of the Society, Mr. D. Mangan, welcomed the members who had assembled on the morning of June the 3rd at Curracloe sand dunes, and summarised the history of the property of 530 acres which was acquired in 1931 and planted during the following two years.

When acquired the area consisted of dry ridges bearing marram grass, etc. which gave way to *Holcus* and various herbs on lower, permanently fixed ridges. Silverweed, sedges, etc. occupied flat "slack" areas.

The main species planted were Scots, Corsican and Maritime pines, with smaller amounts of *Pinus radiata* (*insignis*) Sitka spruce and alder (on boggy flats) and mountain pine on the least stable areas of blown sand.

Maritime pine was direct sown, the others were planted.

The sandhills were described as low (none over 30 feet) and irregular, and rainfall was estimated to be about 38 inches per annum, with a tendency to summer drought.

Mr. Mangan introduced Baron von Vietinghoff of Göttingen University and on behalf of the Society wished him a happy and interesting visit to Ireland.

The Baron replied, conveying the greetings of German Foresters.

Mr. T. McCarthy, Divisional Inspector welcomed the party on behalf of the Minister for Lands, and described the present condition of the plantations.

Corsican pine had formed cleanly-grown, healthy stands of 31 ft. mean ht. and 3½ ins. Q.G.B.H. with a stocking of 1,200 stems per acre which amounted to 1,440 H. ft. over bark. This corresponded to Quality Class III by British Forestry Commission Yield Tables, and represented some measure of overstocking by that standard.

A small plot of *Pinus radiata* of 26 years now stood at 300 stems per acre: 46 ft. top ht. and 7½ ins. mean Q.G.B.H. Volume per acre was 2,295 Hoppus ft. giving a productivity of 72 cu. ft. per acre per annum.

It was mentioned that cow dung had been placed in the pits at the time of planting.

A stand of Scots pine nearby contained 920 stems per acre at 25 ft. top height and 3½ ins. Q.G.B.H. This amounted to 828 Hoppus ft. and corresponded to Quality Class III of the Yield Tables.

On a comparison between these three species *P. radiata* was much the best volume producer: Corsican pine showed the best form of growth; Scots pine was poor in the beginning but had recovered well during the last six years.

Mr. Hanan described a plot of Japanese Black Pine, (*Pinus Thunbergii*) planted as an experiment in 1948.

This species is used in Japan for sand dune fixation, and is slow-growing and hardy.

Two year seedlings were used, and the plants are healthy, though stocking is uneven.

The party were shown prostrate mountain pine which had successfully "fixed" blowing sand over a considerable area close to the sea.

Pinus contorta has been successful and is the only species which has so far regenerated itself; though a very thick crop of maritime pine seedlings were established under a stand which had been burnt some years ago.

During the early years slugs were a problem and caused much damage; later the pine shoot moth gave trouble and the pine shoot beetle for a short time. Mr. N. O'Carroll gave an account of the life cycle of the insects.

There appeared to be no serious pests or disease at the present stage of development; but we were shown a group of dying Corsican pine in a hollow near the edge of the sea. No certain cause can be ascribed for this as yet, but opinions were given by various members. Some suggested that sea water percolation through the sand barrier could be a cause and others that salt water from storm waves might have spilled over the dune into the hollow. It was observed that some side branches which had layered themselves in the sand were living.

In general it was noted that the sand dunes had been successfully fixed, that a grassy and herbaceous vegetation was well developed over almost all the area, with a good deal of bramble (*Rubus* spp) under the Scots pine.

A light layer of dead needles covers the sand under *Pinus radiata* and soil profiles reveal good root penetration, but very little tendency for any definable soil profile to develop.

It was stated that the area planted in 1931 was better stocked, and more productive than that planted in 1932, although both sites were similar, with the P. 31 site the more exposed. It was suggested that more favourable weather conditions in the first year may have allowed of better establishment and that the advantage in vigour of growth had been maintained.

The party were given much valuable information on the detailed history of the plantation by Mr. Michael Kehoe, who has been Head Labourer and caretaker of Curracloe throughout the 27 years since work commenced.

—J. E. JOHNSTON.

Forth Forest.

The party was welcomed by Mr. McCarthy who introduced the forester, Mr. J. T. Cooney, and gave details of the forest. At present it comprises 1,470 acres of which 1,100 acres is planted and 47 unplantable. Planting started in 1933 with 700 acres of *Pinus contorta*. Recent acquisitions have been of a better type of ground, more suitable for the growing of Sitka spruce.

Mr. Hanan provided the historical background. Art, son of Conn of the hundred battles, succeeded Conary and immediately banished his uncle, Ohy Finn Fohart, from Munster. Ohy and his sons went to Leinster where they were given some districts by the king. The inhabitants of these districts were known as *Fotharta* after their ancestor. Two of these districts still retain the name (Forth in Wexford and in Carlow). Up to 150 years ago the inhabitants of the Forth district in Wexford spoke an English dialect, older than Chaucer's English, which had been brought over by Strongbow's settlers.

An interesting situation arose when the area was being acquired, explained Mr. McEvoy. There was no local opposition to the acquisition but, being common land, there were doubts as to the legal title. It was then discovered that the fee simple was held by the crown and that this was transferred to the state at the time of the treaty.

The party then moved on to see an experiment initiated by Mr. Mooney, in which phosphatic manure was placed in the bottom of the pit and alternatively scattered on the ground around the base of the plant. So far no appreciable

differences in growth have been detected. Here also Mr. Mooney gave a short talk on *Pinus contorta* in general, treating of its native habitat, its introduction to Ireland, and the types. He preferred the coastal type for the suppression of heather and on deep western peats.

Mr. Galvin mentioned that a slight but consistent difference is noticeable between the two types even in the nursery stage. He also commented on the fact that one sometimes gets an apparently mixed crop of seedlings from the same seed lot, suggesting that the seed is mixed before export. Typical plants of both types were seen here by the party: the coastal with its short dark green needle attached at a low angle to the leader, and the inland with its longer, paler needle attached at a higher angle.

Next to be seen was an experiment comparing two lots of *Pinus contorta* from home collected seed (Pettigo and Ballygar, grown from seed said to be of Lulu Island origin) with a British Columbia provenance, each type manured and unmanured. A large response was got from manuring in all cases. There was no significant difference in the growth of the two home-collected lots, but both were significantly better than the British Columbia provenance.

Before moving on to the next stop there was a long discussion on the potentialities of the site for tree growth. Mr. MacNamara was strongly of the opinion that with modern techniques of ground preparation and manuring, a more rewarding crop than *Pinus contorta* could be grown.

Compartment 4 contained a crop of *Pinus contorta* planted in 1933, seed origin said to be the "sea coast of Washington". The details were as follows:

Stems per acre	...	950
Mean Q.G. at b.h.	...	4 ins.
Mean height	...	30 ft. Hoppus
Volume per tree	...	1.41 Hoppus feet
Volume per acre	...	1,340 Hoppus feet

The question of the future management of this stand evoked some divergent opinions. Mr. Butler thought that the crop had served its purpose as a pioneer and should be felled and replanted with Sitka spruce, while Mr. Mooney thought that it should be pruned and treated as a normal timber crop. Mr. Butler then brought up the question of putting an economic price on the timber in twenty years from now. What would it then have cost to grow?

The next stop was in Compartment 5, at the "diamond beds". This experiment was initiated by Dr. Anderson in 1933. Diamond shaped areas (7 ft. side, 18 ft. from centre to centre) were picked over and manured with $\frac{1}{2}$ lb. of phosphate. Every tenth bed was left unmanured as a control. At present there is no apparent difference between the manured and unmanured beds although earlier reports recorded the manured beds as distinctly superior.

The perimeter of each bed was planted with *Pinus contorta* (origin recorded as "sea coast of Washington") with Sitka spruce, Japanese larch and Scots pine in varying mixtures in the centres. Only the *Pinus contorta* now remains, for which the following figures were given

Stems per acre	...	493
Mean Q.Q.	...	5½ in.
Mean ht.	...	42 ft.
Volume per acre	...	1,848 H. ft.

This is slightly better than Scots pine, Quality Class I, of the same age.

The trees are rather coarse and somewhat sabred due to their initial wide spacing.

A pit in the undisturbed soil showed a typical iron podsol, which is widespread in this area over the very infertile quartzite and quartz rock.

Wednesday, 4th June, 1958.

On the second day we travelled along the course of the Slancy via Ennis-corthy and Bunclody passing close to Vinegar Hill, the scene of a famous battle during the 1798 Rebellion.

Clonegal State Forest.

On arrival at Coolmeelagh Property the party was again met by Mr. T. McCarthy, Divisional Inspector who introduced Mr. O. Grant, Head Forester-in-Charge and his assistant Mr. A. Gilligan. Mr. McCarthy in describing the forest pointed out that this property was originally part of Bunclody Forest until Clonegal was established as a separate unit in 1941. The Forest at present comprises a total area of 2,858½ acres of which 2,668 has been planted to date.

Our first stop in Compartment 5 was at a stand of Sitka spruce planted in 1928, which though heavily thinned in the past is now marked for a further thinning of approximately 30 stems per acre.

The figures given for this stand were as follows—

<i>Main Crop</i>		<i>Thinnings</i>	<i>Total</i> (<i>Main Crop + Thinnings</i>)
Stems per acre	240	30	270
Q.G.B.H. (av.)	7½	5¾	—
Total Ht. (av.)	62	56	—
Vol. O.B.	2,800	200	3,000

Comparable figures from British Forestry Commission Yield Tables were given which showed the stand to be Quality Class III, but very much understocked by comparison. Everybody agreed that the stand did not look overthinned and that the increased Q.G. and fuller crown development obtained was something to be desired. A boring taken from one of the dominant stems showed an average ring growth of 6 to the inch which was considered adequate for good quality sawlog timber. Final crop stems had been pruned to 20 ft. and a discussion followed on the desirability of high pruning up to 30 ft. at this stage. It was pointed out however that this would add approximately 4d. per cubic foot to the second length of timber at the end of the rotation and it was felt that the price obtainable then would not compensate for the additional expense.

During a short stop in a stand of 70 year old Norway spruce a discussion developed in which Baron von Vietinghoff readily joined. Data for the stand was—

Stems per acre	...	...	230
Q.G.B.H. (av.)	...	...	8¾ ins.
Total Ht. (av.)	...	...	70 ft.
Vol. O.B. per acre	...	...	4,025 Hoppus feet.

This corresponded to Quality Class III of the B.F.C. Yield Tables for Norway spruce. The trees were heavily branched indicating the desirability of high pruning at an earlier date. However, Baron von Vietinghoff confounded everyone by stating that they do not prune Norway spruce in Germany since the timber merchants do not reduce the price because of knottiness; neither do they prune Scots pine but attain reasonably good quality timber by close espacement. Baron Von Vietinghoff intimated that only those trees suitable for veneer purposes such as Douglas fir, Larch, Poplar, etc. are pruned and then only to the extent of approximately 80 stems per acre. In no instance do they prune living branches.

At our next stop many theories were advanced as to what was damaging the buds of Sitka spruce planted in 1957. Some members were of the opinion that the buds were hollowed out by birds, of which the Gold Finch, Grouse and Crossbill were listed as likely culprits. Eventually Mr. Michael Fahy came forward with the most likely suggestion that slugs were attacking the young

shoots and the discovery of a number of large black slugs under an old Scots pine top added weight to his argument.

The next item of interest was a plantation of Scots pine at 900 ft. elevation which had failed and had been replanted in 1953 with Sitka spruce, *Abies nobilis* and Beech. A pit showed the soil to be a Brown Earth type over-lying mica-schist, which seemed sufficiently fertile for normal growth. A discussion then developed as to whether failure was due to exposure or provenance with Baron Von Vietinghoff holding the view that it could not be exposure since Scots pine grows on the bogs of Eastern Germany at extreme exposure.

Lower down the slope a stand of Scots pine planted in 1928 and comparable with Quality Class III British Forestry Commission Yield Tables provoked further discussion. Mr. McNamara was in favour of clear felling and replanting with one of the faster grown conifers such as Sitka spruce which he estimated would yield a volume in 30 years comparable with Scots pine in 50 years. Messrs. McEvoy and Grant thought this method too drastic and advocated marking approximately 80 selected stems per acre in a protective ring and under-planting with *Tsuga*. Following a brief stop in a Sitka spruce stand where comparisons were made as regards stocking and av. Q.G.B.H. with the first stand of Sitka spruce visited, the party adjourned to the old nursery for a picnic lunch.

—P. M. JOYCE.

Mechanised Nursery.

Our party next visited the Department's Nursery at Ballintemple where we witnessed a demonstration of modern machinery as applied to this highly specialised field. Much that we saw here was surprising indeed and in all it proved to be one of the highlights of the tour. We are particularly indebted to the Department for the excellent arrangements made.

It was surprising to see for ourselves, how efficiently modern agricultural machinery has been adapted to the intricate and all very costly work of weed control, lining out, preparation of seed beds, etc. Time, we know, is the all-important factor here and the speed at which this work can now be carried out is most impressive.

Implements for the most part are hydraulically mounted giving ease of access and a switch from one to the other can be made in a matter of moments.

The weed sprayer is a battery of cowed jets, that using common liquid sprays under pressure, can work six rows or so of transplants at a time, at a nice walking pace. The inter-row weed cultivator, very topical this season, is on the same principle. Little damage is done either biologically or, let it be said, mechanically, though it calls for the most exacting care on the part of the tractor driver.

The system of lining out was the envy of many members who know of the 'fever' normally associated with this work. In this operation only the loading and placing of the lining out boards was done by hand. All the other work was carried out by an ingenious machine, the 'Ledmore' plough, which is really a combination of several implements. Given a good soil, well pulverised by the rototiller this machine can earth up the seedlings, plough, roll and cut, to leave all in order for the next line. Gone apparently are the days when a muster of "all hands to the lines" was the call throughout the countryside. Here a team of 15 men, with a tractor etc. can cope with a line 120 yards long, at the rate under optimum conditions of 8,000 seedlings per man per day. In these circumstances the work may be got through in any reasonable period of fine weather and at perhaps half the cost.

The demonstration of making seedbeds was spectacular also. The whole operation was carried out by simple methods, rototilling being the principal preparation, followed by a ridging cum raking appliance. It was only a matter

of moments then to mount the roller. The whole thing reminded us of the speed at which macadam is laid—on the main roads of course. Beds may be sown broadcast but experiments are being tried with an adaptation of the common seed sower for band sowing. This latter method appears to have advantages for mechanisation all through the life of the seedbed.

In all we were rather bewildered at the speed and apparent ease at which a bare piece of soil can be transformed into rows and rows of plants and ribbons of seedbeds. Granted the right conditions a revolution in this sphere seems well on the way in and great credit is due to all concerned.

—P. J. BUTLER.

Thursday, 5th June, 1958.

Bree Forest.

The forenoon was devoted to Bree Forest and in particular to a demonstration of mensuration instruments and methods in a 60 foot high Sitka spruce stand.

At Compartment 8, Bree Hill, Mr. Swan, in introducing Messrs. Hanan and Joyce of the Department's Assessment staff, emphasised the importance of accurate measurements when prices per cubic foot were reckoned in shillings.

The first method demonstrated was by Tariff Tables as now used extensively in standing sales of thinnings in Britain. Mr. Joyce explained that the tables gave volumes per tree based on Q.G.B.H. alone and were applicable to even aged conifer stands up to 80 feet in total height. Volume per tree in a crop is found to give a straight line graph when plotted against Basal area, the 'steepness' of the graph varying with site, age and species. There is a separate Tariff Table for every interval in volume of one Hoppus foot at 12" Q.G.B.H.

The application of the Tariff system is simple: all trees to be included in the measurement are counted; every tenth tree is girthed and every hundredth tree felled and its volume obtained from the Hoppus tables by using mid Q.G. and timber length to 3" top diameter. The Tariff Table and number which corresponds most closely to Q.G.B.H. and ascertained volume is entered in field book for each felled sample and the average Tariff number obtained for the crop. The volumes of every tenth tree can then be read off from the Table and the volume of the crop found by multiplying the total for the girthed trees by ten. For satisfactory use the population to be sampled should contain not less than 2,000 inhabitants giving 200 girths and 20 felled samples. In thinning a good plan was to have a team of four, one to indicate trees for marking, two markers, one to count and measure. Such a team could deal with 2,000 trees per day.

In the course of a discussion to which Messrs. Mooney, Mangan, Enright, J. O'Donovan and Loughrey contributed several further points emerged, e.g., that separate species must be separately booked; that the Tariff system was superior to Volume Tables for large numbers of small trees; that volumes were readily available by Q.G. classes thus facilitating pricing.

The next demonstration was the Sample Plot Method, girthing all trees in sample, finding 40% tree, ascertaining average height by hypsometer and using form factor or Volume Tables to get volume of average tree. Volume of wood was then obtained from formula:

$$\text{Vol. av. tree} \times \text{No. in sample plot} \times \frac{\text{area of wood}}{\text{area of sample.}}$$

The weakness lay in the personal factor of choosing a sample plot but this could be eliminated by using a grid system or random plots. Thirty trees was the minimum for a satisfactory plot so in stands with less than 300 stems per acre a plot larger than 1/10th acre was advisable. This method was very useful

for thinning forecasts when a standard thinning was marked in the plot and thinnings booked separately. Mr. Johnston made the point that the 40% tree was often a sub-dominant in Sitka stands and therefore not altogether satisfactory.

The use of a simple Relascope to give a quick estimate of Basal area per acre was also demonstrated. If all trees which appear larger at breast height than a blade 0.5189 ins. wide held two feet from the eye are counted and the number multiplied by four the answer corresponds to the Basal area per acre. This multiplied by average total height and form factor (from yield tables) gives a very quick approximation of volume per acre.

The Blume-Leiss hypsometer with built-in range finder was also demonstrated.

After the mensuration demonstration the party moved up the Hill led by Mr. Murphy, Forester, and his Assistant, Mr. Breen. Mr. McCarthy, Divisional Inspector, gave particulars of the Forest: started in 1927 it now ran to 1,180 acres of which 960 were planted, 50 acres were in planting reserve and 35 under Nursery. 200,000 H. ft. had already been removed in thinnings.

Interest was centred on a Corsican pine plot, 28 years old on a steep, rather exposed slope, at 400' elevation. It proved to be Q.C.IV as against Q.C.III in sand at Curracloe and discussion turned on the economics of retention on a site considered capable of much higher yields with other species. As the area was small and the stand formed a useful windbreak to better crops retention was generally favoured especially as the area of woods in 30 year age class was so small in Ireland. Mr. Mangan mentioned that creosote penetrated deeply into C.P. giving it a long life as a transmission pole but that the process was more costly as it absorbed more creosote than, say, Scots pine. It was very prone to 'blue stain' after felling and required very careful stacking.

The next stop was at an open 70-80 year old stand of European larch (80 stems, 1,800 H. ft.) and Scots pine (50 stems, 890 H. ft. per acre). Owing to lack of demand for this type of material at planting time the stand was retained but underplanted in 1948 with beech. In the course of discussion it was suggested that the larch would not improve and that it and the poorer S.P. be removed in lengths as soon as market conditions were favourable as the beech were now well established.

Before leaving Bree Hill the President thanked Mr. Murphy, Forester-in-charge and Mr. Breen, his Assistant and Messrs. Joyce and Hanan for providing a most interesting and instructive morning.

—T. McEvoy.

Camolin Forest.

On Thursday afternoon we visited Camolin Forest, where Mr. McCarthy introduced the Head Forester, Mr. P. Madden, and his assistant, Mr. Gleeson. Mr. McCarthy then gave us a brief history of the Forest. The main block, containing 640 acres, was acquired in 1907. Of this, 450 acres carried a mixed hardwood crop on a "brown earth" soil of silurian origin. By 1917 sales from this area had covered the cost of acquisition. The bare land occurred on the flats which now carry Norway spruce and Sitka spruce crops approaching maturity. As might be expected, the spruce suffered from damage by late frost in its early years, but it recovered well and now at 46 years of age, Norway spruce has a mean B.H.Q.G. of $9\frac{1}{2}$ ins. and a total height of 79 ft., and the Sitka spruce measures $11\frac{1}{2}$ ins B.H.Q.G. and 82 ft. total ht. The forest has now grown to a total area of $2,436\frac{3}{4}$ acres of which $2,283\frac{1}{2}$ acres is productive woodland, $71\frac{1}{2}$ acres unplatable and the remainder ($81\frac{3}{4}$ acres) is a plantable reserve.

Our first stop was at a crop of *Cupressus macrocarpa* and *Pinus radiata* planted in 1930 at 6 ft. $\times$ 6 ft. spacing. The present stocking is 270 trees per

acre. The average tree has a B.H.Q.G. of 8 ins. and a total height of 56 ft. with a volume of 11.5 H. ft. giving a volume per acre of 3,100 H. ft. Mr. Hanan opened a discussion on *Cupressus macrocarpa* as a forest tree. He said that the species had a small range of natural habitat being confined to a strip 2 miles long by 200 yards in width near Monterey, California. The species is liable to damage by winter frosts under Irish conditions. Mr. S. Quinn agreed with Mr. Hanan's remarks about the frost-tender characteristic of the species. He said that he had seen a shelterbelt 15 ft. high which was completely wiped out in the winter of 1946-47. Mr. Ryan said that the species was a bad transplanter but it produced reasonably strong and durable timber. Mr. Madden said that direct sowing of *Cupressus macrocarpa* had given good results at Camolin.

Our next stop was at a plot of *Pinus radiata* planted in 1927. The present stocking is 190 trees per acre with an average B.H.Q.G. of 10 ins. and an average total height of 86 ft. The volume per tree is 27.6 H. ft. and volume per acre 5,073 H. ft. Commenting on the fact that the larger trees were on the outside of the plot, Mr. Swan suggested that a heavier thinning prescription would result in a bigger and more wind-firm crop.

A crop of Douglas fir which suffered from a severe Adelges attack in earlier years and was heavily thinned in an effort to restore its health and vigour, aroused a good deal of interest. The crop was planted in 1910 and it now carries 140 trees per acre. The mean B.H.Q.G. is $10\frac{1}{4}$ ins. and the top height is 75 ft. The volume per acre is 3,066 H. ft. As a contrast we looked at a disease-free crop of Douglas fir planted 12 years later (1922) which has a stocking of 150 trees per acre with a B.H.Q.G. of $11\frac{1}{4}$ ins. and a top height of 84 ft. giving a volume of 4,560 H. ft. per acre.

The main block of Sitka and Norway spruce aroused a discussion on silvicultural systems. Several members considered that large blocks of extremely uniform, conventionally-thinned monocultures were subject to an unnecessarily high degree of risk from wind, fungous and insect attack and that a more diversified crop would have many advantages. Mr. McEvoy at this stage mentioned an attempt in this direction which he had seen in the Forest of Ae in Southern Scotland which contained large even-aged blocks of spruce around 30 years old. From the beginning a type of crown thinning was practised aiming at relieving about 80 good dominants per acre from competition in the upper crown but controlling the lower crown by co-dominants in the middle distance. After three thinnings in Norway spruce a clearly defined stand pattern had emerged, the 80 tall dominants having deep crowns and much heavier girth than the remaining trees. The canopy was undulating and deep with promise of greater wind firmness and the prospect of opening gaps for group regeneration and the introduction of a variety of species in shelter. Incidentally the crown thinning of dominants and co-dominants leaving sub-dominants and suppressed trees for ground cover yielded a much larger average size of pole and was more economic.

In conclusion Mr. Mangan thanked the Divisional Inspector Mr. McCarthy, the District Inspector Mr. Crerand, the Assistant District Inspector Mr. Enright, the Head Forester Mr. Madden and the Assistant Forester Mr. Gleeson for their help and co-operation in making our visit such a pleasant and instructive one.

—M. McNAMARA.

Report on Excursion to "Trench 14," Clonsast Bog.

THE unusual subject of this outing brought a very large number of members to the assembly point at Portarlington on 20th April, 1958 from which they drove to the north side of Clonsast Bog near Clonbologue.

Mr. Mangan (President) welcomed all those present and introduced Mr. de Bruc, Forester who, in the unavoidable absence of Mr. Cronin, Head Forester, represented the Minister. He also introduced Mr. Barry, Research Officer, Bórd na Móna, who was the leader of the party for the day.

Mr. Barry gave us some general information on our surroundings and details of Trench 14. He said that the total area of Clonsast Bog under Bórd na Móna was about 4,200 acres and it had been producing machine won turf for the last fifteen years. He explained how the bog was developed in a series of trenches running North to South and how each year's cut ate into the sides of the trenches and widened them. Trench 14 was one of many such trenches in the bog which were at 250 yard centres and about 4 miles long. It had been passed over to the Forestry Division by Bórd na Móna on nominal lease for tree-growing experiments in 1954. Bórd na Móna had to sacrifice something, he said, to make this trench available. It was about one mile long, 30 yards wide and covered $9\frac{1}{2}$ acres when taken over by the Forestry Division.

The Forestry Division had planted 17 different species in half-acre plots which were divided into equal parts, manured and unmanured. The bottom of the trench was levelled off with various admixtures of peat resulting from the machine cutting, and planting was done on the flat, Ground Mineral Phosphate being the manure used. The banks of turf now flanking the trench are from about 6 ft. to 10 ft. high and the bottom of the trench varies from about 2 ft. over the bog bottom at the south end to as much as 12 ft. at the north end. The maximum depth of the virgin bog was about 24 ft. Underneath the surface at the north end is a basal depression of *phragmites* marsh peat overlain by forest peat with pine and birch remains. The bog floor, however, gradually rises until, towards the south end, the subsoil is quite near the surface and appears in the spoil. Remains of pine and birch were evident throughout, while yew is also found in the mid-way parts of the trench.

In emphasising the significance of this experiment in its relation to cut-away bog usage on a national scale when Bórd na Móna turf-harvesting will have concluded Mr. Barry said that as the members would have the opportunity of examining the performance of the various tree species during their walk he felt that he might underline the fact that they would be looking at a unique experiment—something for which there was no comparison in Europe.

In beautiful weather the members proceeded through plots of seventeen species in the following order:—Lawson cypress, Sitka spruce, Norway spruce, Serbian spruce, Monterey pine, Scots pine, *Pinus contorta*, Douglas fir, *Populus gelrica*, *P. serotina*, *P. robusta*, hybrid larch, Japanese larch, Jap. larch and Sitka spruce, Jap. larch and Norway spruce, *Thuja plicata*, *Tsuga*, grand fir, noble fir. The manured plots of each species had received 3 ozs. of G.M.P. per plant except *Pinus contorta* which got only 2 ozs. Planting was carried out in Spring 1955 but considerable beating up was done in the Monterey pine plot the following year.

Interest was first expressed in the peculiar development of the Lawson cypress which had grown quite vigorously but in an abnormal fashion with the stem very thick at the base, the shoots drooping and with a stiff woody growth at the top. Here an average total height of $32\frac{1}{2}$ ins. in the manured half compared with $26\frac{1}{2}$ ins. in the unmanured half.

The most remarkable feature was the superior performance of the pines so far. Monterey pine had grown to an average total height of 28 ins. in the manured half with a maximum of 60 ins. but had only made an average of

8½ ins. in the unmanured section. Manured sections of Scots pine and *Pinus contorta* looked well and had given average total height growths of 27½ ins. and 29 ins. respectively the unmanured P.C. giving only 8½ ins. average. Sitka and Norway spruces have given average height growths of 29½ ins. and 22½ ins. respectively, the latter looking very well. The larches have given very good results but some members were of the belief that the apparent improvement in the vegetation type rendered comparisons invalid in this case.

Throughout, manured plots gave better results than unmanured but this appeared far less clear-cut in some species than in others, notably the larches.

None of the three poplars looked at home and die-back of the leading shoot was evident in all three plots.

Mr. Barry gave us some comparative figures which were of considerable interest. Plantations of similar age in Bangor Erris district, Co. Mayo though not established by the same planting methods gave smaller figures in respect of annual leader-shoot growth. The figures are as follows:—

		Trench 14 inches	Bangor Erris inches
Sitka spruce	1956	3½	2
	1957	5½	3
Monterey pine	1956	9	4
	1957	19	4
<i>Pinus contorta</i>	1956	7½	5½
	1957	16	7½

Many members expressed doubts as to effect wind will have on the trees when they rise above the existing protection provided by the marginal turf-bank faces. Fire was also discussed as a hazard if planting should develop on a big scale.

A discussion also developed on the possibility of planting on bogs from which the peat is won by the milling method. It was pointed out that such bogs would be very different from Trench 14. There would only be about 2 ft. of undisturbed peat over the mineral subsoil on the milled-peat subject as compared with the throw-down and mixture from machines levelled off in Trench 14. It was said that bottom peat was chemically attractive but physically very difficult. The milled-peat surface might be capable of absorbing 900 times its own weight in water. At the southern end of the trench which ran on to the Esker ridge the mineral subsoil was heavily turned up on the surface. This seemed to have an adverse effect on tree growth and there was much talk of chlorosis.

On this important point some thought that the ideal would be the development of machinery which would mix the mineral soil with the peat. It should, some thought, improve the physical condition and chemical balance of the root-feeding medium and might be the secret of success.

With this point of view Mr. Barry said he agreed entirely and visualised a "system of eskers provided by nature for the fertilisation of our peat bogs."

The discussions ended on this note and our President thanked the Minister for Lands and his representative for the facilities provided and regaled the party with the story of the Gobán Saor and the appropriate analogy.

He paid tribute to Mr. Barry for the manner in which he had lead the party and for the generous and masterly way he had given information on all possible points. Great credit was indeed due to Mr. Barry who had been associated with Trench 14 since the work began and who must be, scientifically speaking, the first authority on this project which may yet be of great national importance.

O. V. MOONEY.

Report on other afternoon study tours held during Summer 1958 will appear in our next issue.—Editor.

Danarm D.D.8F Chain Saw.

DANARM announce the introduction of a new One-Man Petrol-Driven Chain Saw of the Direct Drive type—the DANARM D.D. 8F. The saw is equipped with a specially designed Villiers engine exclusive to DANARM. Many new features have been incorporated in its design which is the result of many years of experience and research. The main points to note are—the diaphragm carburettor which enables a saw to be used at any angle, even upside down; elimination of Gear-box—saving weight and improving the design; and the high cutting speed—the chain travels so fast that cutting progress is automatic and effortless. No sudden jolts towards the log, even if the abutment has not been properly pushed against the timber. It is unique among direct drive saws in being able to stand a great overload without stalling.

Another point about the chain speed—it makes a new cross-cutting technique possible; the saw will bore right through the trunk of a felled tree—and then cut up or down as required to avoid pinching.

It seems to be a good tool for the heaviest work of the experienced timber-man—yet so light and compact that it is ideal for the farmer too.

Full details available from J. Clubley Armstrong Danarm Ltd., Abford House, Wilton Road, London, S.W.1., or from Messrs. T. Lenehan & Co., Ltd., 121/2 and 124/5 Capel Street, Dublin in whose advertisement in this issue an illustration of the saw appears.

Statement of Accounts for Year ended 31st December, 1957.

Income			Expenditure		
	£	s. d.		£	s. d.
To Balance from last A/c.	488	11 0	By Stationery and Printing	69	3 9
Less amount due to Secretary ...	18	5 7	" Printing of Journal, etc.	283	6 0
			" Postages ...	31	7 2
" Subscriptions received :—			" Expenses re Meetings ...	64	13 0
2 1st Grade Tech. 1955	2	0 0	" Bank Charges and Cheque Book	1	5 2
10 " " 1956	10	0 0	" Honorarium—Secretary	15	0 0
45 " " 1957	45	0 0	" Prizes ...	15	0 0
2 2nd " " 1954	1	0 0	" Balance in Bank ...	490	10 0
8 " " 1955	4	0 0	Less amount due to Secretary ...	30	9 3
20 " " 1956	10	0 0			
67 " " 1957	33	10 0			
2 Associate 1955	1	10 0			
13 " 1956	9	15 0			
85 " 1957	63	15 0			
In Advance	15	5 0			
					460 0 9
Interest on Investment		195 15 0			
" Journals sold and advertisements		6 5 0			
" Prize donated by Irish Forest Products Ltd.		232 15 7			
" Excursion Account		15 0 0			
		19 14 10			
					£939 15 10

I have examined the above Account, have compared same with vouchers and certify it to be correct, the balance to credit being £460 0s. 9d. which is on Current Account at the Ulster Bank Ltd. There is also a holding of £200 Dublin Corporation 5% Redeemable Stock 1968/73. Credit has not been taken for Subscriptions for 1955 £3 5s. 0d., for 1956 £16 5s. 0d., and for 1957 £49 10s. 0d., which were outstanding at 31st December, 1957.

13th January, 1958.

D. M. CRAIG, Hon. Auditor, 85 Harcourt Street, Dublin.

LIST OF MEMBERS, SEPTEMBER, 1958

* Associate Member.

-
- Allman, David, Galtee Cottage, Cahir, Co. Tipperary.
 Almack, T., 87, Cherryfield Road, Walkinstown, Dublin.
 * Ashtown, Lord, Woodlawn House, Co. Galway.
- Barrett, H. Beresford, Crocknaraw, Moyard, Co. Galway.
 Barry, Thomas A., Experimental Station, Bord na Mona, Droichead Nua, Co. Kildare.
- * Bayley, Major E. A. T., Ballyarther, Woodenbridge, Co. Wicklow.
 * Benjamin, J. H., Holywell, Sligo.
 * Bogue, Maurice, Linen Hall, Drogheda, Co. Louth.
 * Brennan, Miss C. M., 72, Dollymount Avenue, Clontarf, Dublin.
 Breslin, William H., 8, Church Street, Belturbet, Co. Cavan.
 * Briscoe, Brendan, Ardcar, 8, Roebuck Crescent, Clonskea Road, Dublin.
 * Browne-Clayton, Lt.-Col. W., Cashel House, Cashel, Co. Galway.
 Bruton, Patrick J., Kilsheelan, Clonmel, Co. Tipperary.
 * Buckley, John L., Ladyswell, Cashel, Co. Tipperary.
 Bunce, Cornelius, c/o Mrs. Cryan's, Bridge Street, Carrick-on-Shannon, Co. Leitrim.
- * Burgess, Mrs. E. C., 13, Shandon Drive, Bangor, Co. Down.
 Butler, Peter J., Lourdes, Mt. Brilliant Road, Kilkenny.
 Byrnes, M. A., Church Street, Scarriff, Co. Clare.
- * Cahill, Miss Sarah, 12, Waterloo Road, Dublin.
 * Cameron, G. J., "Balgreen", Denholm, Hawith, Roxburgshire, Scotland.
 Campbell, Sean, Irish Forest Products Ltd., 28/30, Up. Baggot St., Dublin.
 Campbell, P. M., Ballyfarnon, Co. Roscommon.
 Cantillon, J., Forestry Office, Lismore Castle, Lismore, Co. Waterford.
 Carrigy, J. P., Main Street, Macroom, Co. Cork.
 Cashman, Timothy, The Demesne, Mountbellew, Co. Galway.
 Cawley, L., 3, Srait Mic Easmuin, Mainistir Fearnui, Co. Corcaig.
 Chisholm, William Y., The Elms, Athy Road, Carlow.
 Christie, Michael, Irish Forest Products Ltd., 28/30, Up. Baggot St. Dublin.
 * Chuter, Noel, Ballyraine House, Arklow, Co. Wicklow.
 Clarke, Francis P., Casino, Avondale, Rathdrum, Co. Wicklow.
 Clear, T., Albert Agricultural College, Glasnevin, Dublin.
 * Collen, Lyall, Garrivhan, Stepside, Sandford, Co. Dublin.
 Collins, Brendan J., c/o Peterswell P.O., Co. Galway.
 Collins, Cormac, Doon Forest, Brookborough, Co. Fermanagh.
 Collins, Maurice, Moyle Park, Clondalkin, Co. Dublin.
 Collins, Timothy J., c/o Mrs. Doody, Convent Road, Tullamore, Offaly.
 * Connolly, Michael, Donacorney House, Drogheda, Co. Louth.
 * Coollattin Estate Co., The, Coollattin, Shillelagh, Co. Wicklow.
 Cormican, Anthony, Belderrig P.O., Ballina, Co. Mayo.
 Corrigan, Fred, Garvagh Forest, Coleraine, Derry.
 Cosgrave, Myles, Ballydowling, Glenealy, Co. Wicklow.
 Cotter, D., Springmount, Dungarvan, Co. Waterford.
 Craig, Duncan M., Honorary Auditor, 85, Harcourt Street, Dublin.
 Cremin, Kevin, Gortarush, Dundrum, Co. Tipperary.
 Crerand, Roderick J., Forestry Office, Enniscorthy, Co. Wexford.
 * Crichton, Mrs. J. H., Rossmore, Silchester Road, Gleneageary, Dublin.

- Crowe, Peter, 22, Upper Merrion Street, Dublin.
- * Crowe, W. A. P., 16, St. Kevin's Park, Dartry, Dublin.
- Crowley, J. J. c/o Mrs. Blessing, 34, Main Street, Cootehill, Co. Cavan.
- Crowley, Jerry, c/o Brennan's, The Square, Buncloody, Co. Wexford.
- * Crowley, P., Lough Eske, Barnesmore P.O., Co. Donegal.
- * Cusack, C. A., Clondalkin Paper Mills Ltd., Clondalkin, Co. Dublin.
- * Dagleish, T. W., Wallace Chambers, John Dickie St., Kilmarnock, Scotland.
- Dallas, William G., c/o The Secretary, Forestry Branch, Ministry of Agriculture, 7, Upper Queen Street, Belfast.
- Dalton, J., c/o 7, Marian Road, Rathfarnham, Dublin.
- Dalton, Matthew, Ironworks, Ballybofey, Co. Donegal.
- * Daly, E., 'Padua', The Rise, Malahide, Co. Dublin.
- * Daly, J. F., 8, Flemingstown Park, Churchtown, Co. Dublin.
- Darcy, J., c/o Mrs. Watchorn, High Park, Bilboa, Co. Carlow.
- Deasy, J. J., 11, Templeville Estate, Templeogue, Dublin.
- * Deegan, M., Errigal, Manor Avenue, Greystones, Co. Wicklow.
- * Deeney, Vincent, 114, West Street, Drogheda, Co. Louth.
- de Gruneil, Thomas, Forestry Office, 16, Eyre Square, Galway.
- * Deigan, Miss M., 22, Morehampton Road, Donnybrook, Dublin.
- * Dennis, P., Fort Granite, Baltinglass, Co. Wicklow.
- Desmond, Andrew, c/o Richardson's Hotel, Ballinamore, Co. Leitrim.
- Desmond, John, c/o Mr. J. J. O'Hara, Hillside House, Monaveen, Woodlawn, Co. Galway.
- Devine, M. J., Kilfennon, Waterside, Derry.
- Diffley, L., Main Street, Kildysart, Ennis, Co. Clare.
- Dillon, Sean M., Kilfinane, Kilmallock, Co. Limerick.
- Dineen, F., c/o Mrs. J. Hartley, Mullinavat, Co. Kilkenny.
- Diver, Neil, Forestry Office, 16, Eyre Square, Galway.
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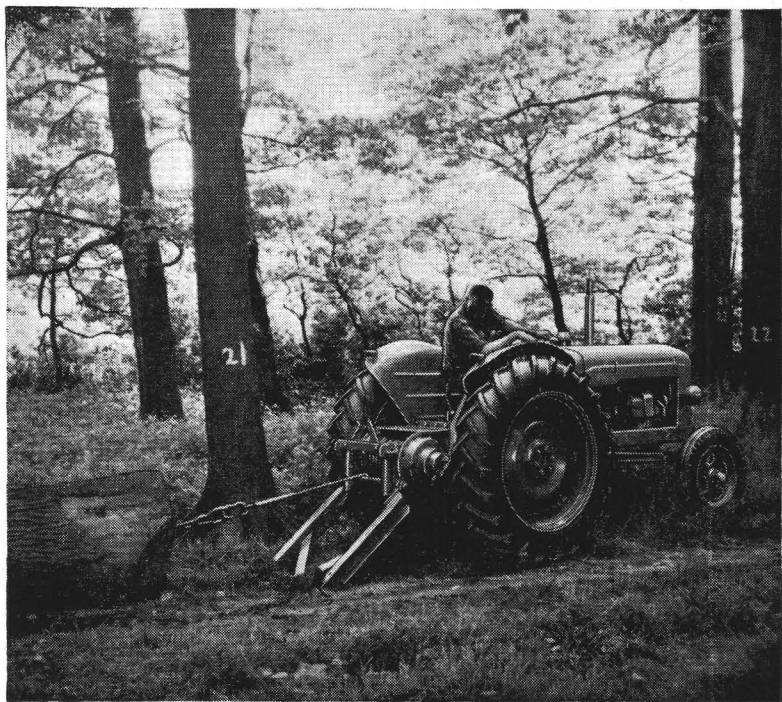
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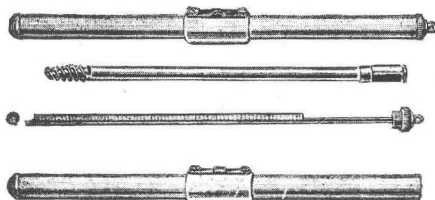
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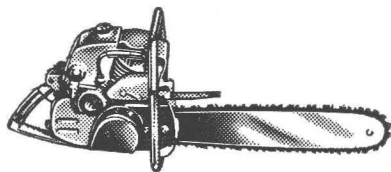
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