

# IRISH FORESTRY

Journal of the Society of Irish Foresters

Published Twice Yearly

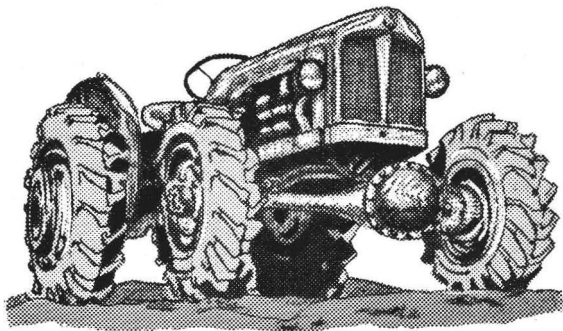


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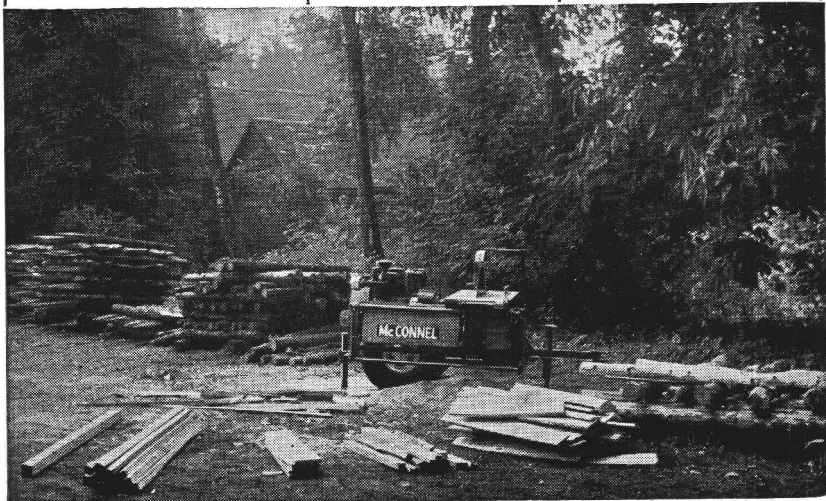
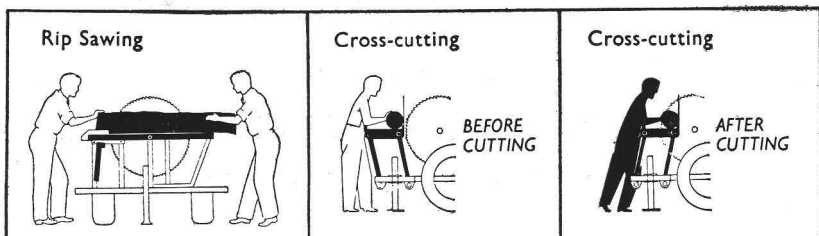
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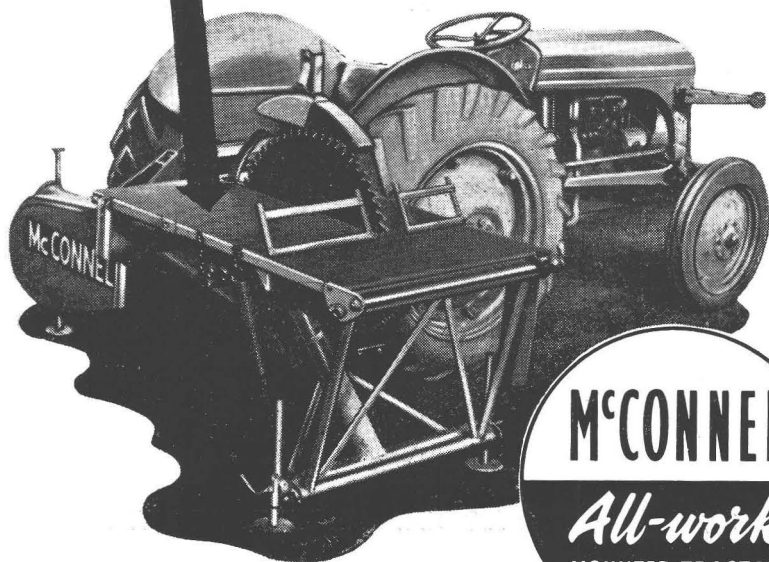
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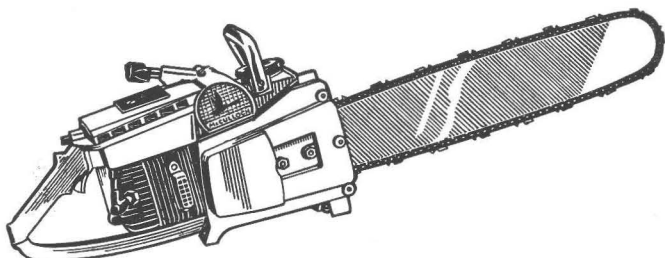
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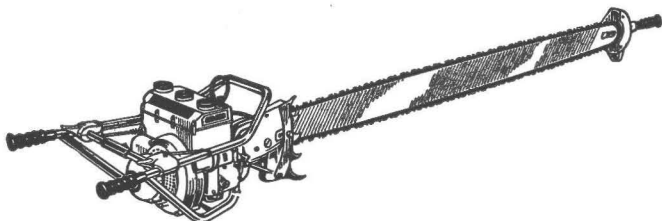
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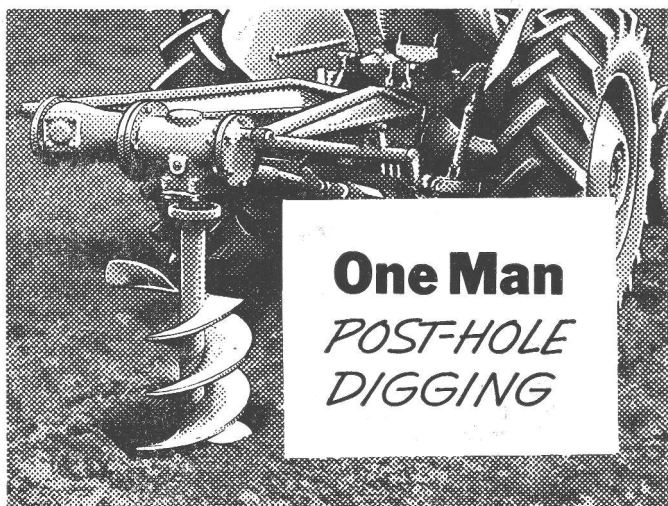
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## CONTENTS

*(The views expressed in the articles and notes in this journal are not necessarily the views of the Editor or of the Society of Irish Foresters.)*

COVER PHOTOGRAPH: Elms, mainly *Ulmus stricta*, beside the Cashel-Tipperary road.

LIST OF OFFICE-BEARERS AND COUNCILLORS ... .. 34

MR. CLEAR'S APPOINTMENT ... .. 50

### Original Contributions :

Imminent Management Problems in Scottish Forestry  
(*M. L. Anderson*) ... .. 35

Seed Production (*R. J. Griffin*) ... .. 47

### Reviews :

Conifers: South African Methods of Cultivation ... 51

Forest Machinery ... .. 52

Letter to the Editor (*H. Beresford-Barrett*) ... .. 57

### Society's Activities:

Annual General Meeting ... .. 59

Fifteenth Annual Study Tour ... .. 70

Forest Machinery Field Day ... .. 85

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# IRISH FORESTRY

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 Volume XVI.

Autumn, 1959.

 Number 2
 

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## Imminent Management Problems in Scottish Forestry.\*

By PROFESSOR MARK L. ANDERSON

I propose to lead up to my main thesis by making a few elementary observations.

One of our difficulties in British and Irish forestry is the question of nomenclature. So many of our technical terms are translations—often of rather a crude kind—of continental terms, and the term 'management' in forestry is one of these. No one who plants trees or grows trees is likely to be pleased when he is told that his plantations are not properly managed. He will usually take it as a slur upon his organizing ability, business capacity, etc. He may be the type of person who, in the ordinary sense, manages everything well.

The term 'management' in forestry, however, stands for something more than that. It is, I believe, derived from a translation of the French term 'aménagement', which really means a "management plan, properly drawn up, approved, and recorded with the intention that it should be operated".

I suggest, therefore, that the term 'forest management' necessarily implies that we are concerned with much more than the mere running of a forest, namely with the *working* of a managed forest or of managed woodlands, that is, with defined areas of woodland or forest, managed with a true forestry objective.

At this point I must explain what I mean by 'a true forestry objective' because trees can be planted with no such objective in view and the plantations can be run without any true forest management being essential.

We must, I think, draw a very sharp line between the forester proper and the tree-farmer. The objective of the tree-farmer is merely to grow '*crops*' of trees on his ground—usually in any odd corner he has available—with the sole object of felling and selling what he regards as the final 'crop' at some future date—and as he hopes at a profit. He is not interested in the perpetuation of his woodland or forest. He buys what plants or seed he requires at odd times, plants at odd times, thins at odd times and clear-fells at odd times. There is no

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\* Paper read at annual general meeting of The Society of Irish Foresters, Dublin, March 14th, 1959.

clear relationship between the parts of his forest and hence there is no true 'forest management'.

The forester proper, on the contrary, always has as his main objective a permanent forest, the function of which is to supply a need *in perpetuity*. Broadly speaking, there are two main functions performed by any forest, namely a productive function i.e. the production of some consumable commodity, required by man, or a protective or amenity function. In every case, however, the stand or forest which exists or is created is expected to function effectively in perpetuity. If the main function is a productive one, the main object of management will be to produce the most possible of the best possible in perpetuity. If the main function is that of amenity or protection it will be to keep the forest permanently in the best state of health and never to so treat it that it ceases, even for a decade only, to fulfil its expected function.

In either case, if the forest or woodland is to function satisfactorily, the forester has to arrange for two things—namely, for the perpetual *regeneration* of the forest and for *constant tending* of the forest to ensure that it is either maintained in the state of highest value production or in that healthy state which conserves its protective value or its amenity value.

To simplify my further argument, I propose to confine myself to a consideration of the productive forest only, but it must be stressed that the protective and amenity forest needs to be managed in the forestry sense just as much, if not more than, does the productive forest.

The basis of all sound forestry is sound silviculture. The forest cannot be satisfactorily regenerated nor can it be properly tended to ensure its being kept in good health unless sound silviculture is practised. A first essential in the management of any forest is that the owners should lay down the *silvicultural* objective or the *growing-stock* objective. This may involve a consideration of economic factors, but a perpetual forest can never be realized if the locality factors are not such as to ensure that the type of growing-stock aimed at can exist on the area in a healthy state in perpetuity. Before any real management plan can be drafted it is therefore, vital that the growing-stock composition, the exploitable size and some conception of the time taken to reach that size, should be fixed. Not until then is it possible to arrange for satisfactory management. In fixing the growing-stock objective full consideration must, of course, be given to the problem of regeneration, especially of whether natural or artificial methods are to be applied. The tree-farmer always uses artificial methods, the true forester, only when natural methods fail or *are uncertain*.

Once the forester has been given his growing-stock objective, his management task becomes clear-cut. When the exploitable size has been fixed and when he has, by appropriate mensurational procedure determined the average rate of growth in his forest, he can ascertain the time it will take for trees to reach that size and he then fixes what is



called the 'rotation'. This is, of course, a very important matter, because of its effect upon his main task, the satisfactory regeneration of his forest. If the rotation is too short it may be *impossible* to use methods of natural regeneration and if too long, it may lead to site degradation or loss of production.

Assuming, however, that the rotation length is silviculturally satisfactory, the forester is now in a position to arrange for the perpetual regeneration of his forest. He is working with a perennial enterprise on an area basis. When this enterprise is fully constituted, it consists of a part which is ready for regeneration on which the trees have attained exploitable size. This part, in theory, will amount to the whole area divided by the selected rotation. The rest of the area constitutes the 'sufficient reserve', that is an area of sufficient extent to bear stands all of the same extent as the area to be regenerated to the number of the length of the rotation less one. There must be a full complement of these stands, and, ideally, they should form a graded series so that every age from 1 up to the rotation age less one is represented. I hope that I may be forgiven for stressing what must be an elementary point to everyone here, but I feel I must do so, because this fundamental principle of forest management is so often ignored and the ill effects of ignoring it are so little appreciated.

From the very beginning of every forestry enterprise, whether it be that of creating a new forest or whether it be that of bringing a natural virgin forest into full production, the object of management is to bring about this satisfactorily graded distribution of age-classes, and anything which is done which has the opposite effect is fundamentally unsound. For example, if in any one year an area larger than the area which should be regenerated normally, when the enterprise has been fully established, is planted or regenerated, that is a step away from normality and ultimately leads to difficulties, besides being economically unsound. In the virgin forest, on the other hand, the problem usually is to get rid of ever-mature stands of low production and to replace them by stands of maximum production, but it would be wrong to assume that the best way to do that is to regenerate more than the normal area. As a rule, taking everything into consideration, the best plan always is to regenerate no larger an area than the whole area of the forest divided by the exploitable age.

In effect, therefore, to apply principles of forest management to any forest means *that*, as the first essential step. When this problem of timing has been settled the next thing is to arrange for the best spatial arrangement over the ground of the areas to be regenerated. In this connexion several things may have to be considered, including questions of utilisation and marketing. Silvicultural considerations may require that the areas to be regenerated should be as widely dispersed as possible; economic considerations may require that they should be concentrated as much as possible. In drafting the management plan

some compromise may be effected. For example, it is not unusual to break the rotation up into *periods* for regeneration and to break the area of the forest up into *blocks* for regeneration, each within its period, stands of nearly the same age being grouped together in a block. These blocks may be dispersed by parts throughout the forest, or concentrated in a single place, but in all cases adherence to the fundamental principle of satisfactory age-class gradation is essential. It is true that there are sometimes economic advantages in grouping three or four regeneration areas together for regeneration in one year but that is a process which can be carried too far, with harmful effects.

In some types of forest it is possible for the regeneration to go on over the whole area simultaneously and for the structure of the stand to be such that all the age-classes exist thoroughly intermingled in the stand. Such a stand is difficult to manage. In other types of forest the mixture is less intense and exists in the form of groups of trees having the same age per group. This is less difficult to manage.

With these preliminary remarks I now propose to deal with my main thesis.

Compared with most continental countries, the existence of large forest units in Scotland is a relatively new feature in our forestry. It is true that one or two landowners have in the past owned or created extensive areas of plantations, but, for one reason or another, these have not proved to be permanent. Mainly as a result of two world wars, they have been largely destroyed. Fairly extensive areas of unmanaged forest have survived in parts of the Highlands. A common feature of all these large wooded areas has, unfortunately, been the complete absence of forest management as it is understood in the modern meaning.

In other words, none of these areas has been subjected to a long-term plan of management which would ensure their perpetuation in some form or other, however unsatisfactory. There has been no real effort to establish normality or to ensure sustention of the growing-stock, production and yield. As a result when crises demanded it or opportunity arose, they have been brutally devastated and in many cases extinguished. This is true, not only of former woodlands, but also of the justly famed extensive areas of artificial woodlands created by enterprising landowners in various parts of the country, particularly, so far as Scotland is concerned, in central Perthshire, Peebles-shire, Strathspey, Deeside and around the Moray Firth.

Further, with regard to the smaller woodland areas, these have usually been established for secondary objects, such as shelter, game-coverts and so on, and few, if any, have been made the subject of a permanent management plan with commercial forestry as the aim. Even to-day, under the Dedication Scheme, the short-term plan of operations cannot be regarded as a satisfactory substitute for a proper long-term

plan intended to maintain the wooded state and production in perpetuity.

While we may justly claim to be expert *afforesters*, we have never made any serious attempt to *manage* properly the so-called forests which we have created. It can truthfully be said that we have as yet no properly managed forest in Scotland, i.e., with a properly graded series of sizeclasses from the seedling up to the exploitable tree, satisfactorily arranged over the ground in one way or another in such a way as to enable a constant yield to be obtained from the forest every year—a yield not in excess of the production, but approximately equal to the production when that has been brought to a maximum. It is therefore of very great importance that this problem of the future management of the large artificial forests now being created should have immediate consideration. We should be looking ahead and testing out various procedures which will ensure that the forests of the future are properly managed and not merely completely blotted out again in some future crisis. We can learn a good deal from what has happened and been done on the continent. It is my purpose in this talk to try to define the nature of the problem, which is now urgent, and to suggest what steps might be taken to make future forest management, not only easier, but possible.

When the Department of Lands acquired an area of over 3,000 acres of mature woodlands at Cong, it was the first occasion on which I was brought up against the problem of management and I was not at all clear how to proceed. I have learnt a good deal since.

#### *The Nature and Origin of the Problem.*

The nature of the problem can best be understood if we now restate the essential features of a well-constituted forest.

1. The forest should be such that it fulfils the functions expected of it in the most satisfactory manner. There should be no sacrifice of exploitability.

2. The forest should be one adapted to the locality and the site so that it can be maintained there in sound health in perpetuity.

3. The economic objective and the growing-stock objective best fitted to enable the economic objective to be realized should be determined and clearly laid down.

4. When the economic objective is one of providing produce, i.e. a productive one, the growing-stock should be *so* constituted and distributed over the forest *that* an annual yield can be removed equal to, but not exceeding, the annual production, when the latter has been raised to a maximum.

5. To enable this to be done, all parts of the forest should be equally accessible so that the most mature trees can always be removed

as well as those inferior trees which are not mature but have to be removed in the interests of the better trees, from any part of the forest.

6. The growing-stock should be so constituted that there is always a succession of classes decreasing in age, which can follow on to replace the most mature class, normally removable or exploitable. It is the need for this sequence of age-classes, conveniently distributed and located, which makes forestry unique as an enterprise.

7. To enable the succession of age-classes to function properly they must be present in the forest in satisfactory proportions.

8. There must be a satisfactory outlet or market for all the produce provided by the trees that are exploitable.

If all these eight conditions are satisfactorily fulfilled, the formation of a plan of management is relatively easy and the forest will be able to contribute to human welfare in the most efficient manner. It will be in a position to furnish a constant supply of raw material for human use and will be a source of constant employment. Moreover, if the forest is not too extensive and widely scattered, the labour force can be concentrated at convenient centres and will not have to travel long distances to operational points or fluctuate in numbers from time to time. *Permanent* communities can then become established consisting not only of forest workers but also of a population employed in wood-using industries which do not have to range far for their raw material.

#### *Size of the Forest-unit.*

Before we ask in what respect many of Scotland's newly created 'forests' fall short of the above requirements, we may give some thought to the question of size of unit. In many cases, especially in respect of private woodlands, the size of the forest is prescribed by the area of land available for forestry. The *minimum* size depends first upon the main economic objective. A shelter-belt, for example, may be as small as two acres and still be perfectly effective. The minimum size for a productive woodland, i.e. one which will yield something of value every year depends very much upon the locality conditions and the species grown. It is, for example, quite possible to run small coppice areas on short rotations to give an annual yield in perpetuity fairly easily. Quite arbitrarily, I am going to suggest that the smallest *high-forest* area that can be run to give an annual yield in perpetuity is one of 50 acres, which must be on fairly productive ground with at least average rate of growth.

The question of the *maximum* area for convenience of management is equally important. Remembering that large forests often have to be broken up into two or more working-circles, and that these in turn, if large enough, have to be once again broken up into two or more working-sections or series, I am going to suggest that a convenient

*maximum* area for a series or working section is one of 1,800 acres. In most cases one of 1,200 or 1,500 acres will be more convenient. If the forest is an even-aged one this will give an annual coupe of at least 10 acres if the maximum rotation is 120 years or 150 years. There are many reasons for not having coupes much larger than that in any forest.

It is important to observe, moreover, that if the forest-unit is less than some 300 acres in extent, it becomes very inconvenient, if not impossible, to run it by the clear-felling or shelterwood systems. Some form of irregular treatment has to be adopted, either group selection or stem-by-stem selection, *if the maximum annual yield in perpetuity is to be realized*. A coupe of less than 5 acres is seldom worth while annually and it is usual to work the forest intermittently by periodic fellings rather than annual fellings. For example, a felling of 25 acres every five years instead of one of 5 acres annually, but this procedure has its obvious inconveniences—especially in respect of sustaining employment.

There should be a plan of operations for each working section or series, especially in hilly country or where the terrain is much broken so that means of access are restricted to a limited number of routes, e.g. along valleys.

Now let us see in what respects are Scotland's newly created forests defective. The first point that strikes one is that many of them are too large to be worked as one management unit. They require to be divided up into smaller units, not exceeding 1,800 acres each. This would not, I think, apply to any of your Irish forests.

Another point that strikes one is that all the forests and all parts of them have as their only function the productive one. It is true that small areas are now being treated as fulfilling secondary functions such as the provision of amenity and recreation, but no parts of forests have as yet been regarded as protective, yet it is quite certain that in all hilly areas where planting has been carried far up the slopes, a zone of protective forest, requiring special treatment and management will be necessary. These areas should be set aside *now* as separate units.

There can be no doubt that large areas of the new forests are not adapted to the locality and site, but this is a silvicultural problem in the main which will solve itself as time goes on and experience is gained. I shall show how advantage can be taken of this position from a *management* point-of-view.

I believe I am right in saying that seldom, if ever, is the economic objective and the growing-stock objective specifically laid down when a new forest is being created. All that can be said is that a genuine attempt is made to grow the species thought to be best suited to the site, but usually preference is given to fast-growing species. That can lead to great management difficulties, however desirable it may be economically or politically. Slow-growing species which can remain healthy and stable for long periods have important management advantages, especially when they suit the site.

With regard to the need for uniform accessibility to all parts of the forest, there have been great improvements in this respect in recent years, although often at heavy cost. It is well known that many of the first plantations, established on a large scale by the State, received no consideration so far as means of future access was concerned. There are still extensive high-lying, remote parts of some forests which manifestly cannot be made so accessible as the remainder. Either access to these should be improved or they should be set aside as parts of a separate working-circle or section from the main area, and put under a separate plan.

The most serious defect, however, is that the principle of sustention has in all forests been deliberately neglected. No attempt has been made to space out the afforestation programme so as to secure the essential gradation of age-classes in each forest. For political reasons the planting up of large units within the space of only a few years has been undertaken. While it is true that this was the most rapid means of obtaining the reserve of grown trees softwood timber which it has been the main policy of the State service to ensure, it inevitably leads to great management difficulties and is the negation of sound forestry. It would have been very much better to constitute units for management purposes of on the average 1,800 acres each, fixed a rotation—better called an establishment period—divided that into 1,800 acres and planted the number of acres arrived at annually in that unit and no more. For example, if the establishment period were put at 60 years then 30 acres a year would have been planted in each 1,800 acre unit and no more. In due course, all the other operational activities would have followed on the same modest scale until the 60th year, at which time a consideration of what the exploitable size and age might be would fall due. Subsequent management procedure would depend on the decision then **made**.

While there are certain disadvantages in this procedure—they are mostly short-term ones and, in my opinion, far outweighed by the long-term management advantages.

This rational afforestation procedure would furnish the succession of age-classes in satisfactory proportions which is essential for sound management. Instead, most forests present the spectacle of a small range of age-classes excessively represented. I am aware that some foresters see a possible solution to this difficulty in regarding whole regions or even the whole country as one management unit and they think that the age-class gradation will be fully represented even if it happens to be scattered far and wide. This represents a scatter of employment and of production which cannot be satisfactory and may involve movements of population and of enterprises on a larger scale than that occasioned by the recent storm-damage in the north-east of Scotland.

Lastly, we can be sure that there will be a market for all the produce

provided by the exploitable trees? This is indeed a difficult question concerning which we foresters must have faith. I think, however, that more than faith is needed. One way to meet this difficulty is to conform to the old adage—don't put all your eggs in one basket. We should grow a variety of trees which is not merely economically sound but silviculturally sound, so long as we grow them on the sites suited to them. In particular we should not grow too much of one class of produce, especially if it is of an inferior quality. Nor should we grow too much of those species which grow rapidly in youth but cannot be kept standing for long periods without deteriorating. However slow-growing they may be, Scots pine and oak are long-lived. Other useful species in that respect are European larch, beech and sycamore on suitable sites.

#### *Suggested Remedies.*

While I have already hinted at some remedies to some of the troubles, there are several major steps which require special consideration with a view to remedying some of the major defects. Improvement of accessibility to all parts of every forest-unit is one obvious remedy. Our predecessors were often well aware of the importance of this and many private woodlands are admirably served with roadways.

There remain two very important major steps to be taken and which demand immediate action, namely:—rational sub-division of forests into smaller management and working units, and establishment of a more satisfactory gradation of age-classes within these smaller units. I propose to consider these two steps in turn.

#### *Fragmentation of Management-units.*

The primary sub-division of any forest-unit should be on the basis of the functions performed by the unit. Areas utilized for production should be separated from those utilized for protection or for amenity or any other secondary function. It is quite a normal thing, for example, on private estates to reserve a part of the woodland for amenity purposes and to dedicate the rest for production—the two areas being managed under separate plans. This procedure should also be adopted in all forests where areas have to be classed as protection forest. In hilly regions there will normally be a high-lying exposed zone of forest which cannot be worked by regular silvicultural systems, but will have to be run by some form of selection working. It should thus be one of the first steps in the introduction of proper management to determine the boundary and extent of all such protective zones in terrain where they are necessary. These zones will constitute a separate working circle and may have to be divided up into two or more series. There is no minimum area which can be worked in this way; consequently the



demarcation and segregation of this area will leave over an area of forest which can be worked by any desired silvicultural system or systems, if it is large enough for more than one working-section. If this left-over area is less than 300 acres there would be very strong reasons for adopting some method of uneven-aged working, for reasons already given.

The next basis of sub-division of the forest-unit would be on the basis of the silvicultural system to be adopted. It might be desirable for example, to work one part of the forest on the clear-felling system and another under the shelterwood system.

The third basis of fragmentation of the forest would be on the basis of size. If any area of the forest suitable for working under one system only exceeded 1,800 acres, then it would be very desirable that it should be broken up into two or more management units, preferably not less than 1,200 acres in extent. Each of these would have to be organized as a separate management-unit, under its own plan. The main bases of the sub-division would be on *topography*, next on the location of markets and next on the location of labour, but in some cases the basis might be one of rate of growth and production.

#### *Establishing a More Satisfactory Age-class Gradation.*

Having broken up the forest areas as just suggested, it is quite certain that owing to the manner of their creation, most of them will be found to consist of a few large blocks, each of one age-class. The problem thus arises how to set about remedying this unfortunate position and it is a problem which calls for very drastic and bold action.

The first point to consider is the probable exploitable size attainable and to be aimed at. There are various aids which enable some estimate to be made. It obviously depends mainly upon the species grown and upon the locality factors. Once determined, the time taken to reach that size can be worked out, giving the 'rotation' for even-aged working. This may vary from say 60 years to 120 years.

The next point to consider is the *youngest age* at which the species composing the forest become exploitable, i.e. so useful that they can be clear-felled at some profit, however small. This will vary with the same conditions as before from 20 to say 50 years.

This second age indicates the age which the oldest plantation in the forest must attain before any conversion into a graded forest begins.

The difference between that age and the exploitable age or rotation length then gives the length of time required to complete the conversion up to the time when further fellings will no longer result in loss of exploitability.

The area to be felled and replanted each year—granted that the forest displays uniform productivity throughout—is the total area of

the series divided by the rotation length. If this area is multiplied by the difference between the initial exploitable age and the final exploitable age it will give an area equal to a fraction of the forest only. The remainder of the forest will consist of stands that are all of the final exploitable age. Their felling and removal will not be completed at the age however but will cover a period of time equal to the initial exploitable age and the last coupe to be cut will thus be older than the rotation by the initial exploitable age.

This can be made clear by taking a concrete case. Suppose for the sake of simplicity that the forest unit to start with consists of one age-class only of say Sitka spruce. Suppose that it is decided that the final exploitable age is 60 years; suppose that it is considered that the stand can be clear-felled at 30 years and sold for chip-board or pit-props. The initial exploitable age is then 30 years and the final one 60 years and the difference is 30 years. In the first year of conversion, if the area of the forest is 1,800 acres, 30 acres of 30 year old stand are cut; in the second and succeeding years again 30 acres. At the end of 30 years half the forest or 900 acres will have been converted. The other half will be 60 years old. It will take another 30 years to convert the other half and the last coupe to be cut will be  $30 + 30 + 30$  years old or  $30 + 60$  years old or 90 years old.

Let us take another example; this time 1,800 acres of Scots pine, the final exploitable age of which is fixed at 120 years and the initial exploitable age at 40 years—for pit-props. As soon as the stand is 40 years old the first coupe of 15 acres is felled and replanted. For  $120 - 40 = 80$  years, each year 15 acres are so dealt with, at the end of which period  $80 \times 15 = 1,200$  acres will have been converted, leaving 600 acres to be dealt with in the last 40 years. The age of the last coupe in this case will be  $40 + 120 = 160$  years. When it has been converted the forest will then contain a complete gradation of age-classes from 1 to 120 years, as required.

Where the individual coupes are to be located will depend upon circumstances. Very very seldom, indeed will it be possible, even if it were desirable, to have a rigid chessboard arrangement. The more sensible procedure will be to deal first of all with the more unsatisfactory stands of more rapid growth. Areas of obviously *slower growth* should be left to fall due for felling near the end of the rotation. Areas of good ground planted with unsatisfactory, possibly fast-growing species, will obviously be chosen as soon as possible for treatment.

Normally in Scotland, therefore, the coupes will be scattered throughout the forest irregularly and the coupe for any given year may even be broken up into two or more separate parts. This constitutes an approach to the procedure which has to be adopted in converting a forest-unit for selection working, which I now propose to touch upon.

*Procedure for Uneven-aged Forest.*

Where for any reason the aim is to work the forest-unit by some system of selection working, a rather less drastic procedure is required.

In this case, especially if there are many gaps and small unsatisfactory spots in the stands, the conversion can be begun without serious economic loss even before the trees are exploitable.

The first step in this case is to examine the rate of growth with a view to deciding upon a suitable length of *cycle of operations*. If the conditions are such that the rate of growth requires intervention at short intervals, say every five years, then the length of cycle will be 5 years. More often, however, it will be longer, up to 8 years. Once the cycle has been fixed the whole of the forest-unit is then divided up into as many equal sized blocks as there are years in the cycle. These should be lettered from A to E or H and each year one block is visited and all cultural operations required therein are carried out. The other blocks are not touched, unless, perhaps, every half-cycle, to carry out urgent thinning and tending. In the current block or block of the year, a certain proportion of its area requires to be regenerated. This proportion depends upon the time estimated for the trees to reach final exploitable size. If, for example, that is fixed at 100 years, then for the whole forest each year a hundredth of its area must be regenerated, all within one block. If the cycle is one of five years, then the area of the block is a fifth of the forest and one twentieth of the block must be regenerated. Single trees or groups of trees must be felled to give that area for regeneration within the block, and this will be repeated every five years. Hence at the end of the 100 years, each block will have been visited 20 times and should contain trees or groups of trees varying in age by five-yearly intervals from 5 years to 100 years.

Size and number of groups vary, but area per annum must not exceed one acre.

Some of these groups will still be in the weeding stage, some in the cleaning and most in the thinning stage, while a few will be ready for final felling, but the forest should be fully stocked with a normal stocking and gradation of size-classes.

The size of the initial groups can be varied to suit the species grown. For light-demanders the gaps must be larger and, of course, fewer,—their total area always remaining constant. There are obvious risks in this way of working but there are also many important advantages. One essential is a complete and satisfactory net-work of extraction roads, so that removal of material is rendered easy. I have not time to deal with the silvicultural aspect of this form of working.

*Conclusion.*

In this talk I have therefore drawn your attention to what seem to me to be extremely important management problems and I have suggested some possible solutions which call for very bold and rather

drastic action. Unless some such steps are taken now however, it seems to me that the future of many forests recently created and now being created will be seriously jeopardized. Some sacrifices must be made in order to introduce that conformity with the principle of sustention which an all-too-hasty afforestation policy has ignored.

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## Seed Production

By R. J. GRIFFIN

*The World Seed Campaign of F.A.O.*

THE study of increasing the quantity and of improving the quality of the agricultural, horticultural and forest products of the world is the special concern of the Food and Agriculture Organisation of the United Nations. At their ninth session in Rome in 1957 they discussed the enormous gap which exists between the present world level of production in Agriculture, Horticulture and Forestry and that which could be obtained by application of existing scientific knowledge. The conference concluded that "the extensive use of high quality seed of improved 'varieties' is one of the most generally and economically applicable measures for increasing productivity and improving quality of agricultural, horticultural and forest products". It was decided to launch a seed campaign and designate 1960 or 1961 as the International F.A.O. Seed Year.

The term "Variety" as used in this article is not equivalent to the botanical category of '*Varietas*' or variety but to the new term Cultivar, which denotes an assemblage of cultivated individuals, which are distinguished by any characters, morphological, physiological, cytological, chemical and others, significant for the purpose of Forestry, Horticulture or Agriculture and when reproduced sexually, or asexually, retain their distinguishing factors.

The use of unsuitable seed in agriculture becomes apparent almost at once, whereas in forestry, poor results may not appear for some years. In the case of European larch of high Alpine origin, die-back does not show until it reaches the thicket stage. Hence the use of unsuitable seed in forestry may jeopardise the efforts and investments of many years. Not alone must seed be of superior variety, it must also be clean, viable and healthy, so as to avoid low yield of crops, or even failures.

Three important factors in seed production are :—(1) The identification of superior varieties; (2) The production of seed of good quality of these varieties; (3) That the supply of seed be so organised and regulated that it is possible to produce seed that is true to name and

satisfies certain minimum standards. Since good seed years occur at intervals of three to five years it is important that a complete collection of seed be made from all selected stands. Seed stands are classified as follows:—A plus stand is one in which over 75% of the trees are well shaped dominants, extreme forms absent and the crop free of disease. A near plus stand is one in which 50% to 75% of the trees are well shaped dominants and free from disease. A normal stand is one in which 25% to 50% of the trees are well shaped dominants. A minus stand is one in which less than 25% of the trees are well shaped dominants or any stand suffering unduly from disease or insect attack. Plus and near plus stands should be fully collected from and the seeds kept separate. Minus should never be collected from.

A superior variety of a forest tree is one which when grown on a range of sites gives rise to (a) vigorous crops, (b) straightness and cylindricality of stem, (c) resistance to disease and insect pests of economic importance, (d) ability to withstand adverse conditions, (e) ability to bear viable seed, (f) ability to produce timber of good quality and in some cases to produce valuable minor produce. By home collection from these varieties seed equal to or even better than that imported will be produced.

#### *Treatment of Seed Stands.*

Stands suitable for seed collection should be thinned to eliminate unsuitable tree types, to free the crowns of the seed trees, and in this way increase seed production. Partial girdling of the stems also increases seed production, but this treatment should be carried out before the end of April and in this way the trees are not damaged. It should not be applied if the trees are already flowering and fruiting satisfactorily. If stands are properly selected and orchards properly handled the supply of seed required for the annual programme should be available from home sources. Two types of seed orchard are envisaged. The first type contains clones of grafted plants derived from a common parent and planted, in such a way that each clone has an equal chance of pollination by all other clones, on sites isolated from pollen of the same or related species. The second type of seed orchard consists of selected plants raised from seed of a known good variety or produced by controlled pollination. These should be established at twice or three times normal spacing on good forest sites, well isolated from pollen from undesirable sources. The plants are encouraged by pruning to develop spreading crowns and seed of the new variety is produced after intensive pollination.

#### *Seed Collection.*

Collection of cones is now simplified by the introduction of the Swiss tree bicycle, with the additional advantage of the nylon safety

line. The scrambling net even though it appears on face value to be satisfactory has some disadvantages. The main one being in the cost of its erection. Four men require one-and-a-half hours to do the job. Its economical use is restricted to isolated trees of *Tsuga Heterophylla*, *Thuja*, and *Chamaecyparis Lawsoniana*, or trees on which two men would have from three to four days' collection without moving the net. These new aids to climbing have reduced the cost of collection considerably in other countries and if used properly could do the same here.

Collection of cones at the right time of year makes for easy extraction and gives the maximum yield per bushel. *Tsuga*, Cypresses, and silver firs shed seed very rapidly and they should be collected very quickly and before the cones are fully ripe. In the case of silvers collection should be completed as soon as the cones start to soften and their scales loosen otherwise a good percentage of seed will be lost. *Tsuga* and *Thuja* cones should be collected as soon as they start to change colour from bright green to golden. Spruces and Douglas fir should be collected when they reach a bright golden colour. In pines and larches seed shedding is slow and cones should be allowed to turn brown before collection begins as extraction is made very difficult by collection of unripe cones. In the transport of cones care should be taken that they are packed in a dry condition, as heating or moulding will set in if left too long in bulk, with a consequent deterioration in the seed. Broadleaved seeds should be packed for transport in hard containers as they are easily damaged or crushed in sacks.

#### Seed Extraction.

All seeds requiring heat for extraction are treated at Avondale in a timber drying kiln. Dry heat and steam are available from a boiler and so extraction is carried out by heating and damping. The optimum temperature ranges from 95° F. to 105° F. From tests carried out last year any further rise in temperature shows a marked drop in germination. Temperatures below 95° F. slow considerably the extraction rate and give little rise in germination. *Tsuga* was extracted at different temperatures, beginning at 130° F. and lowering by 5° each time until 90° F. The germination of each sample increased each time from 18% germination at 130° F. to 71% germination at 95° F. Below 95° F. showed no increase but the method of cleaning at the time did not enable the removal of non-viable seed from the sample. Extraction of *Tsuga heterophylla*, Douglas fir, Sitka spruce, Japanese larch and European larch is now much simplified by the use of a threshing mill fitted with an awner and piler through which the cones are passed. These have no further need of being placed in the kiln for extraction by heat. They are passed through the awner and piler in the cone state and the seeds are extracted, de-winged, cleaned, and all non-viable seed removed in one operation at a cost of eightpence per pound of clean seed. The germination as a result of this new method of extraction is

now 80% and the sample is equal to anything imported. In twelve hours working time 321 lbs. of Norway spruce and 300 of Sitka spruce were de-winged and cleaned at a cost of 8d. per lb. The process does not harm the seed as it is but a controllable current of air blowing against a screw type conveyor. With this new method the current year's collection could be made available for sowing the following Spring, thus avoiding storage of seeds and consequently a deterioration in quality. With these new aids to climbing, this new method of extraction which has revolutionised seed production in this country, and the full utilization of all seed sources available both in State and privately owned woodlands, it is now possible to supply the demands of home requirements for a twenty-five thousand acre programme and put in storage a reserve to cover poor seed years.

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## Mr. Clear's Appointment

The best wishes of all members will go to Mr. T. Clear on his appointment as Professor of Forestry in University College, Dublin. This chair may be considered to be in direct line of succession from that held by Professor Augustine Henry from 1913 to 1930.

Professor Clear is a graduate of University College, Dublin. At the conclusion of his studies there he was awarded a travelling studentship. This brought him to Germany where he studied at the Forestry High School of Eberswalde and other forestry institutes. He has worked in Prussia, Thuringia, Danzig, Poland, Saxony, Bavaria, Hartz Mountains, Baden and Hessen. He also spent four months studying forestry engineering, surveying and inventory in Sweden.

In 1937 he joined the staff of the Forestry Division of the Department of Lands, but resigned in 1938 to take up the post of Lecturer in Forestry, U.C.D., which he has held since.

Professor Clear's services to the Society of Irish Foresters have been equalled by none. He has acted as Honorary Secretary to the Society since its inception in 1942 and, except for a short period, has also carried out the duties of Honorary Treasurer.



Professor Clear.



## *Review*

# **Conifers : South African Methods of Cultivation.**

By W. E. HILEY, C.B.E., M.A.

*Published by Faber & Faber, 24 Russell Square, London. Price 21/- net.*

THE spectacular nature of the afforestation schemes undertaken in the southern hemisphere and particularly in South Africa are a constant source of wonder to European foresters. In spite of the remarkable results that have been achieved very little information has hitherto been available about the methods used and as a result most people have very vague and often erroneous ideas about South African forestry especially their wide spacing and heavy thinning techniques. Mr. Hiley, who is an ardent admirer of South African forestry, as a result of two visits he has made to the plantations there, has now given us a very valuable account of the work being done. As he says, in the preface to this book, South African forestry is unique. It is unconventional and at the same time rigidly standardised. Most important of all in these competitive times, the South Africans appear to be growing their timber extraordinarily economically. It is most interesting to read about the work of such remarkable men as Craib and O'Connor and to learn how the research work carried out by these people was so productive of results in an amazingly short time by any reckoning.

The main thing to be learned from a study of this book is that planting trees can be a highly profitable business if approached in the right way. There is, however, no cut and dried prescription. Every country will have to find out for itself the best methods of cultivation and thinning; the right types of land to use; the species best suited to land and climate and the markets that need to be served or created. We must admire the South Africans, however, for their ability to recognise the importance of using the right ingredients for success, namely the right trees, the right land and the right men.

Mr. Hiley has again made a notable contribution to Forestry in these islands and at a rather critical time. The forest industry now generally recognises the need for greater efficiency and is seeking by every means to lower the costs of production so that timber products will become cheaper and cheaper and thereby more competitive. The harvesting of light timber is expensive, so that silviculture must aim at the production of reasonable dimensions in thinnings and final crop timber. The South Africans have made notable advances in the field of operational efficiency in forestry in so far as the cheapening of the growing of timber is a test of such efficiency.

Mr. Hiley concludes : "There is a very strong probability that the

adoption of similar methods would greatly cheapen the growing of timber trees here. The working out of methods which are appropriate to our species, our markets, our soils and our climate will require a large amount of research". If we are to avoid the rebuke that we are not managing our plantations with professional competence we must also pay heed to this plea for enterprising experiment.

T.C.

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## Forest Machinery

By E. R. HUGGARD, M.A., B.A.I., A.M.I.C.E., and T. H. OWEN, B.S.C.

*Published by A. and C. Black, 4-6 Soho Square, London. Price 24/- net.*

IN so far as it brings together in book form practically all the equipments than can be applied to forest operations this can be a very useful guide to forest owners though obviously in arriving at a decision to either purchase or hire equipment much more information is necessary.

The suggestion in the preface that it would "stimulate intelligent experimentation in every sphere of forestry mechanisation", is a very important aspect and considering the items stated elsewhere to be in need of development e.g. a light machine for clearing forest drains in young timber and as a recent requirement here, a high pruning saw, should lead to work along these particular lines. I have always felt that the manufacturing industries would meet specific development requirements if the problem was properly explained to them, and while it can be said that the market is limited and consequently the cost of development would have to be spread over a small number of finished products, this is not a sufficient reason for baulking at the prospect. If this were done the machine designs would be special to Forestry rather than adaptations which is now the general rule. For example the authors state on page 55 in connection with ploughing; "it is difficult to see how costs could be reduced by improving the design of the machines now available"—one way would be to alter the gear ratio of ploughing tractors so that machines could work at designed engine R.P.M. rather than half throttle which is now the case.

In dealing with "The Mechanised Forest" the history of mechanisation is pertinently if of necessity rather inadequately dealt with. The statement on page 2 that "it would be short sighted policy to set up an organisation on the assumption that the horse will always compete favourably with the machine" is open to criticism. The authors have shown that horses have decreased by 70% and while they have not developed the theme, the remaining horse population has in general neither the breeding nor the training to handle timber, and the "teamster" is a dying skill. An examination of modern mechanical

methods of extraction of thinnings, especially pit props and pulpwood (and extraction from windblown areas) shows it is doubtful if any mechanical process will better the horse in the foreseeable future. Consequently any organisation that has a programme of such extractions should make haste to establish a suitable horse colony. If at any stage machines seem to be competitive then the horses can be disposed of over a period without any great loss to the organisation.

The saving of time and the precision that can be obtained with machine use is well brought out. In a seed bed count at a mechanised state nursery here, in one instance it was established that 1 lb. of Sitka spruce yielded 19,000 extra seedlings. The extra yield is attributed to the mechanised preparation of the bed and in particular to the accurate spreading of the sand cover by a grit distributor.

A factor that must be borne in mind, however, is that while machines can reduce the time to complete a particular operation very often they can only be worked in the summer months and must of necessity be idle for some months of the year—this can be an uneconomic proposition especially if by their introduction certain staff become redundant for the period of the machine use and then need to be re-employed for some other operation during the winter—in an emigrant country such as Iteland this redundant labour may well not be available when required. Careful thought must of necessity be given to this question of redundant labour before mechanising. The authors are very correct in saying that despite the reaction of organised labour the individual worker welcomes a machine that will lighten his work and the forest owner should provide this aid if he possibly can. Usually he will have to compromise with cost reduction and retention of necessary minimum staff especially where casual labour is not available or is difficult to deal with.

The application and operation of machinery is dealt with in one chapter which is rather a pity in that this is one of the most important aspects of all forest mechanisation. The authors should have developed at length the problems of operator training, especially technical education at school level, machine maintenance, machine overhaul, and mechanical organisation. This last point is touched on in only a very general way and while the problems of maintenance and overhaul are mentioned the details of the organisation necessary to carry out this work are not shown, though in a way these are subjects probably best left for another book. It is stated at page 83 that Grader operators are easily trained—good operators are very difficult to get.

The statement on page 19 that "it is often desirable to keep the same operator with a machine", is not strong enough; it is of the greatest importance that wherever possible the same operator should be kept with the machine in that there is then never any doubt as to who was negligent if the question arises. If an operator knows that the machine is his so to speak it is obviously in his own interest to maintain

it properly; this is quite apart from the fact that the more conversant with operating the machine he becomes the more satisfactory is his work likely to be. Some civil engineering contractors actually bring the operators to the base workshops when their machines are being overhauled so as to familiarize them with the construction and to point out any parts that might have been inadequately looked after.

The authors have rightly stressed the question of housing or covering for machines—it speaks very badly for management if machines are left on forest sites unprotected—tarpaulins are comparatively cheap when compared with the cost of machines and for wheel tractors a portable garage is easily and cheaply made up.

The costing system shown is, as indicated, that adopted by FAO/ECE and it will help management when setting up a cost system, something which, as the authors state, is indispensable. One point that is a problem in Ireland is that a great many machines were bought from the U.S.A. prior to the original devaluation of the £1 and this meant that machines greatly increased in price overnight. One way to take care of price fluctuations like this is to use the replacement charge rather than the purchase price for the figure A in the formulae quoted.

One very important aspect of costing is as a control to ensure that machines are being operated at the lowest possible cost and are being sold off when this starts to rise. This aspect has only been touched on and as it is of great importance I append here a very brief account of one system of American origin that may be used. This is known as the Metre System (Most Economical Time to Replace Equipment).

The following items are costed each year :—

Depreciation—by actually obtaining from the suppliers a trade-in figure for the machine.

Repair and overhaul costs.

Cost of unavailability due to maintenance of the machine on the site.

Cost of lack of productivity due to obsolescence.

The running total of these divided by the running total of the hours operated gives a figure which is indicative of cost/hour of all of the above. This running quotient should fall steadily from year to year. When it begins to rise it is a clear indication that the machine has now been run to the point where all the working hours have been obtained at the lowest possible price—the machine should then be sold off as if it is retained the extra hours are being obtained at a higher price.

The rates per hour shown for wheel tractors and crawlers appear to be high considering that they do not take account of profit or operators' wages.

For the most part the book is directed to a description of the various mechanical tools available to foresters with brief specifications and some

excellent photographs. As it does not curtail the equipments to those in use in the British Isles one can feel happy that American and Continental methods are presented though no Russian machine is mentioned. Line drawings showing cross sections of excavations would have been helpful.

A chapter dealing with the use of the wheel tractor would have been very welcome in that now when 7-8 miles per sq. mile of roading is proving acceptable the use of the wheel tractor is increasing and its use in the mechanised nursery is an essential. The basic prime mover in State Forestry here is the wheel tractor and various ancillaries are in use with it; ploughs, dozers, graders, trailers, sawbenches, winches, rotovators, compressors. In this last case it is very hard to decide whether to use the 3-point linkage compressor or the bolted up unit depicted at page 91. The possibility that if one unit breaks down the other can be detached readily and the fact that excess weight is not being hauled around the forest unnecessarily, commends the 3-point linkage unit to one reader.

The use of 4-wheel-drive wheel tractors is also very much on the increase here and because of the cost of track overhauls of crawlers any effort that can be made to increase the performance of these 4-wheel-drive machines is worthwhile in order to reduce the crawler fleet to the minimum.

An error seems to have been made in the weight of the Cobra shown at 33 lbs. The correct weight is 53 lbs.

Towed Rollers have proved quite satisfactory in Ireland for forest road work.

The authors are right in this comment that the multiple purpose machine; crawlers—excavator—loading shovel—will not displace the bulldozer (more correctly called angledozer) though for the smaller owner their purchase may well be a proposition.

The use of the 10-14 ton dozers here has proved the point that heavier machines are rarely necessary and too cumbersome for forest road work. In connection with working dozers downhill a few difficult areas in Ireland have proved this conclusively and indeed an examination of the principles clearly indicates that the dozer "punch" is very much influenced by the grade e.g. a 1 in 10 grade working uphill detracts 224 lbs. per ton of crawler so that for a D.6 class machine weighing 10 tons there is a loss of punch of 2,240 lbs. or, if working downhill, an addition of 2,240—a total difference of 2 tons. This difference is bad enough in itself but if, as happened in at least one instance here, the ground conditions are not able to sustain the full tractive effort of the machine and track spin was occurring even on the level—then uphill working was impossible. Fortunately it was possible to get to the top of the grade and work downhill thus availing of the 2,240 lbs. above mentioned to aid the tractive effort. This site also made clear the necessity for working the wet sites in the summer. In

small forest operations transport of dozers by truck can be quite all right but where proper supervision of both the loading and unloading is impossible this reviewer would advise the use of low loader only, even for the smaller machines.

The table shown for dumpers and tippers required to keep face shovels fully employed brings out a point which is of interest—that the use of dumpers on long hauls is a very poor proposition; e.g. to keep a 21 cu. ft. machine busy on a  $\frac{1}{2}$  mile haul requires 10 dumpers and 3 tippers and as the distance increases dumpers are not shown at all. The Shawnel-Poole system developed on a wheel tractor as a rear dump is not mentioned.

In the case of compressors it is suggested that these be drained during frost whereas for other machines anti-freeze is recommended; a definite policy on this matter is essential and considering water conditions on the sites the use of anti-freeze for the winter and rust inhibitor for the summer in conjunction with 2 flushings per year would seem practical.

The authors include a section dealing with a recent development in aerial extraction—the Tractor Operated Aerial Ropeway. This is not yet on the market. The basic unit was developed by J. A. Cuthbertson of plough fame, and is operating at Loch Gailhead in Scotland.

A double drum which has been devised by Boughton & Sons Ltd. and used to carry a strawline as is suggested on page 129.

One picture on page 131 showing a D.4 hauling some very poor quality logs is hardly an economic proposition.

The tables shown in the appendix are useful although in one instance the table is not in agreement with calculations of "Caterpillar" who claim that every 1% of grade requires 22 pounds of draw per pull per ton so that a 1 in 10 grade or 10% takes 220 lbs. as against 114 quoted in the appendix.

Generally, the authors in wishing to present to the forester and forest owner a book which would enable him to see at a glance what equipments are available for any particular problem within the forest have been successful.

D. O'SULLIVAN, B.E., A.M.I.MECH.E.

### **Other Publications Received**

*Fibre board and Particle Board. Report of an International Consultation on Insulation Board, Hardboard and Particle Board, sponsored jointly by the Food and Agriculture Organisation of the United Nations and the Economic Commission for Europe, Geneva, 21st January to 4th February, 1957. Published by F.A.O.*

*Fibreboard and Particle Board. Technical papers submitted to the International Board, Hardboard and Particle Board. Geneva 1957. 6 Vols. Published by F.A.O. and U.N.E.C.E., Rome.*

*Smith's Pitprop Tables: Home Timbers.* Additions to 1959 edition computed by D. C. Leith. Published by Stobart and Son, Ltd., 29, New Bridge Street, London, E.C.4. Price: 5s. 6d.

Gives the contents per piece for each size of prop commonly used, and for long timber such as is cut up into props. Gives the solid contents of 100 lineal feet of each size of prop. Shows the quantity of timbers described by lineal feet and by numbers of props which will weigh five and six tons at 45 Hoppus feet to the ton.

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### *Letter to the Editor*

## **Wanted - A FOREST COMMUNITY**

Sir,

When I arrived at Shillong from Burma in 1942 I was welcomed by that great forester, Mackarness, then Senior Conservator, Assam. Over his office were the words: "You can take the man out of the forest but you cannot take the forest out of the man." I think that is about the best description of a forester that I know. Anyone whom it does not fit had better go on the Stock Exchange or something else.

It was said that a man who made two blades of grass grow where one grew before was the greatest benefactor of the human race. This pales to insignificance before the task that devoted band, the foresters in Ireland, have to face. *Vide* the foregoing, they are two:

i. To grow millions of trees where none grew before and in some cases may never have grown.

ii. To create a forest-minded community.

The latter task is probably the harder by far.

In the days of my youth, I, with other students, was going round a forest in Alsace. Feeling between French-Germans was then exceedingly high. We were being shown around by an officer who started each harangue with "*Les Boches*" and said how they went wrong. With us was the Strasbourg City forester whose views differed, and at last his patience gave out and he said: "*In Frankreich gibt es keine Wälder, nur Hecken.*" (There are no woods in France, only hedges). This was going much too far but it does, I think, show what the foresters in Ireland had to start with. Not only had they no sizeable woods to speak of, but there was no forest tradition at all, no skilled woodmen, no villages where lives depended on the forest and no real forest industries; no feeling for wood as a major product.

I think the first thing that strikes one after returning to Ireland



after some years is that in a town, apart from doors and windows, one sees no wood at all. No wooden, or even half-timbered houses. In the country likewise one sees no wooden gates, paling fences, wooden sheds, or anything made of wood used as a major part of a work. Even grandstands are concrete.

The reason is that wood is scarce and dear.

The Forest Service by pure grinding hard work has managed to acquire a couple of hundred square miles of forest land. The difficulty, to my mind, is that this has had to be got in scattered blocks all over the country, a square mile here, a couple of square miles there, and so on. How they must wish the miles *could* be square and not involve fantastic lengths of fencing per unit of area.

There are other uses for forest but the main one is to produce a crop of timber which will be available annually, perennially, to the timber using industries, *close to the said industries*. In other words the annual yield must be enough to justify the establishment of processing industries, sawmills, pulp factories etc., in or near the forest, with an adequate skilled labour supply.

I submit that piecemeal planting of comparatively small forests will not help to produce cheap forest produce, probably the most expensive thing on Earth, relative to its value, to transport otherwise than by water.

There are areas in Ireland—West Galway where this is written is one—on which, in the last century or so, millions of pounds in money and much effort has been expended, to my mind uselessly, in an effort to recreate a viable agricultural community. It produces a few sheep and cattle and the emigrants save the C.I.E. trains and buses from travelling completely empty—that is about all.

The land does however grow trees reasonably well.

My submission is that the whole area west of the great western lakes, Corrib, Mask, Carra and Conn be scheduled as a forest and administered as such. There are of course areas that would have to be excluded, there is a strip of land from Castlebar to Westport for example, and the existing population would need their fields. Some cultivation would be needed to provide food for the forest staff.

Such an arrangement, to my mind, is the only economic solution for the area and would produce a prosperous major industry. Of course it would take time and money: grazing rights would have to be bought out, the question of turbary rights would have to be considered—in time wood fuel should be available cheaply saving the laborious turf-saving work.

Timber processing industries would be established in the area, and as none of it is far from the sea, exports would not be hampered by long hauls, just as timber would no longer have to be carried as now up to 50 or 60 miles.

In time the inhabitants themselves would be mainly interested in the forest, in a word the forest would have got into the man.

At first sight this may seem a mad scheme. But is it? Anyway perhaps I have started a discussion and if there is anything in the idea perhaps "exegi".

Yours, etc.,

H. BERESFORD BARRETT.

Co. Galway.

July 31st, 1959.

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## Seventeenth Annual General Meeting.

THE Seventeenth Annual General Meeting of the Society was held in the Shelbourne Hotel on Saturday, March 14th, 1959.

The private meeting was opened by the President, Mr. D. Mangan.

The minutes of the Sixteenth Annual General Meeting having been published in "Irish Forestry, Vol. XV. Nos. 1, and 2, were taken as read. The Secretary then read the Council's Report for 1958. This Report and the Financial Statement\* were formally adopted.

The results of the Ballot for the new Council were announced and the election was confirmed by the meeting. Arrangements for excursions for 1959 were outlined.

The changes in the Constitution relating to Articles V and VI, which had been explained and adopted at the Sixteenth Annual General Meeting were finally ratified.

### Report of the Council for 1958

THE new Council met at 85 Harcourt Street, Dublin on Tuesday, 14th January, 1958. Twelve members attended.

The members made arrangements for the 16th Annual General Meeting and for the reception of Dr. Sabroe of Denmark who was coming as guest speaker.

Sub-committees were appointed to deal with the following matters: Editorial, Excursion, Financial, Constitution, Forestry Diploma.

The Second meeting of the Council was held on the 18th February, 1958. Ten members were present. At this meeting, arrangements for the Annual General Meeting were completed and changes in the constitution were drafted for insertion on the Agenda.

An excursion programme for 1958 was arranged and included day

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\* Published in Vol. XVI, No. 1.

visits to Clonsast, Powerscourt, Togher Wood, Portlaoise, Aughrim and Delgany. Provisional arrangements were also made for excursions in the Mallow, Sligo and Galway regions and local organisers were nominated. Arrangements for the Annual Study Tour were also put in hands.

The Third meeting of the Council was held on 13th May. Eleven members were present. The meeting arranged that in future the Journal should appear on the 1st April and the 1st October each year. Details of day excursions and of the Annual Study Tour were completed.

The Fourth meeting was held on 23rd September. Eleven members were present. The proposed Study Tour in Denmark in 1959 was taken up at this meeting and a sub-committee was appointed to consider the matter. Plans for a winter meeting were also discussed and a committee appointed to make the necessary arrangements.

The Fifth meeting was held on Tuesday 11th November. Thirteen members were present. Arrangements for a General Meeting to be held on 22nd November were completed. A report on the Danish tour showed that a large party had already booked and that arrangements for the tour were well advanced. The preliminary arrangements for the Annual General Meeting 1959 were discussed and it was agreed that Professor M. L. Anderson should be invited as chief speaker.

The Sixth meeting of the Council was held on 9th December. Eleven members were present. The Council completed arrangements for the elections for the New Council, for the Annual General Meeting 1959 and for the Annual Study Tour 1959. The Chairman, Mr. D. P. Mangan thanked the members of the Council for their loyal support and co-operation during the year.

The Council is pleased to record that the year 1958 was outstanding in many respects. Membership has reached an all time record and 49 new members were enrolled. The income from subscriptions now exceeds £200 for the first time. The increase is almost entirely due to the enrolment of new technical members. Associate membership is, however, static for some years and with the new interest in private forestry an improvement in this respect is expected.

The subscription rate for our Society has remained unchanged since the foundation of the Society in 1942 and this, we believe, is a unique record among societies in Ireland or elsewhere. That this has been possible in a period of rapidly increasing costs, is due largely to the untiring efforts of the Council.

The members will also have received in 1958 what in effect amounts to three issues of the Journal, viz. Vol. XIV, No. 2, and Vol. XV, Nos. 1 and 2. There is an increasing demand for our Journal from overseas. The Journal is now received by libraries in the following countries: Great Britain, U.S.A. (six States), Canada, Poland, Germany, Holland, Norway, China, Japan, South Africa, New Zealand, Sweden, Italy and Turkey.

The Financial Statement has been circulated and appears on the folder calling the Seventeenth Annual General Meeting. A new feature introduced into this report (financial) is a comparison with the previous year which should be of interest to members and give a good indication of trends in income and expenditure.

As reported in the Journal there was a very full programme of meetings during the year and in spite of the poor weather, attendances were excellent. The Society held a General Meeting in November which was most successful and it is felt that similar meetings will in the future be a feature of our activities.

## Presidential Address

Ladies and Gentlemen,

As the Society requires that the President, on this occasion each year, delivers an address—"valedictory" or otherwise—it falls to my lot to try and set out some of the items of forestry interest which came to my notice during the past twelve months. I make no attempt whatever at giving a comprehensive "review" of forestry in 1958/59 but merely wish to refer, as briefly as possible to some of the features of the world forestry picture and to then touch on some happenings nearer home.

In regard to general world forestry, I have drawn my facts and figures mainly from the most recent available Bulletin published in Rome in 1958 by the Food and Agriculture Organisation. The figures necessarily refer to the 1957 period, so it will be appreciated that they leave us slightly behind the times.

Dealing with the question of timber utilization, we note that the region felling the greatest volume of timber in the period under review was North America, followed by the Soviet Union and then Europe.

In Africa, Central and South America and Asia it is noteworthy that from about 70% to 90% of the timber felled was for fuel. As might be expected in the more industrialised regions, the accent is on logs for sawmills, pulpmills and veneer plants.

A rough figure for the value of the world timber harvest in 1957 is 27,400,000,000 U.S. dollars, comparing with 27,800,000,000 for 1956. The breakup of the 1957 figure is:

Sawlogs	...	...	14,200	million	dollars.
Pulpwood	...	...	8,900	"	"
Pitprops	...	...	500	"	"
Other industrial wood			900	"	"
Firewood	...	...	2,900	"	"
			<hr/>		
			27,400	"	"

*Sawnwood:*

In 1957 the U.S.S.R. headed the list with 79 million m<sup>3</sup> of sawn timber, the U.S. coming a close second with 78.8 million m<sup>3</sup>. Other large producers were Japan (23.1 million m<sup>3</sup>) and Canada (15.8). The order of preference in Europe was Sweden, Poland, France and the German Federal Republic.

For the 10 years 1948 to 1957, coniferous species accounted for 80% of the total sawnwood volume, although occupying only slightly over half the world forest growing stock.

*Trade:*

In 1957, Europe and North America accounted for 82% of the total world exports of coniferous sawnwood (Europe 49% and North America 33%). During the 10 years to 1957 Europe changed from a net exporter to a net importer, while in the Soviet Union the opposite was the case. In Europe Sweden, Finland and Austria dominated the export market. The U.S.S.R. increased its coniferous sawnwood shipments from 0.47 million standards in 1956 to 0.74 million in 1957 thus becoming the third largest softwood exporter (behind Canada and Sweden).

The United Kingdom was the leading importer, followed by the United States, while West Germany, Holland and Italy were high on the list.

Broadleaved species in 1957 accounted for about 10% by volume (14% by value) of the world sawnwood.

*Sleepers:*

Wood continues to be the principal material for railway sleepers and in western Europe it accounts for 80% of the total. Of these 75% are broad-leaved species.

It is anticipated that wood will maintain its leading position on account of improvements in technique and wider use of preservatives, together with better methods of rail-fastening. Wood has the qualities of shock-resistance, elasticity, low-conductivity, easy working and comparative cheapness.

*Plywood:*

While the production of plywood since pre-war has been growing continually, the growth has been at a gradually decreasing rate. The 4% increase from 1956 to 1957 was one of the smallest in the last 10 years, even though world production in 1957 was at a record figure of 11.7 million m<sup>3</sup>.

The U.S. produced 6 million m<sup>3</sup>, the U.S.S.R. 1.2 million and Japan 964,000 m<sup>3</sup>. Other important plywood producers were Canada, West Germany, Finland and France.

Exports of plywood reached a new record level of just under 1.1

million m<sup>3</sup>, of which Japan exported 328,000 m<sup>3</sup>, followed by Finland with 259,000 m<sup>3</sup> and the U.S.S.R. with 100,000 m<sup>3</sup>. 86% of the years' exports of plywood were to Europe and North America. The U.S. took 40% and the United Kingdom 31%. As a contrast, the United Kingdom in 1948 bought 43% of the total plywood imports, while the U.S. took only 6%.

#### *Pulp:*

The outlook for pulp is one of continued expansion, even though the rapid increase of the last year has slowed somewhat. World production for 1957 was 50 million tons. Japan's output increased 600 per cent. in the period 1948-1957 to a figure of 2½ million tons, putting that country in sixth place, following the United States, Canada, Sweden, Finland and the U.S.S.R. West Germany's 1957 production was 2½ times that of 1948, being 1.4 million tons. This made the Federal Republic the third largest producer in Europe, following Sweden and Finland.

An increase has been noted in the utilisation of broad-leaved species for pulping and also in the use of wood residues such as slabs, edgings, veneer cores, etc. Expansion in the newsprint and fibreboard industries has meant that mechanical pulping held its ground at around 30-35% of total pulp production.

Europe and North America accounted for nearly 88% of the total world imports. The leading pulp importing countries are the United Kingdom (from Finland, Norway and Sweden) and the United States (importing from Canada).

#### *Newsprint:*

Total world output soared in 1957 to 12.35 million tons, an increase of about 3% on the previous year. The increase in the period 1948-57 was 63%, the U.S.S.R. nearly doubling its output. Canada continued to be the leading newsprint producer with 47% of world output the runners-up being the U.S. the U.K., Finland, Japan, Sweden, France and the U.S.S.R.

During the last 10 years, newsprint production commenced in Ireland, Yugoslavia, Argentine, Israel, India and New Zealand.

Exact figures for the production of "paper other than newsprint" were difficult to procure, but about 35% consisted of printing and writing paper, the remainder being a great variety of wrapping, tissue and industrial papers. Production grew steadily in the past 10 years to a 1957 record level of over 28½ million tons, the United States contributing 11.9 million tons.

#### *Paperboard and Fibreboard:*

Both reached new record production levels. Again, Ireland is mentioned as one of the countries which began production of fibreboard

during the present decade. Other countries starting during the period were, Bulgaria, Czechoslovakia, Hungary, Netherlands, Spain, Mexico, Argentina, Brazil, Union of South Africa and Israel.

The world-wide spread of the fibreboard industry is indicated by the fact that the U.S. share dropped from 62% in 1948 to 43% in 1957. Production of compressed fibreboard increased steadily at the expense of non-compressed.

As regards Particle Board very little information was available, beyond that European production was about 70% of total world output, with West Germany predominating in the industry.

This unfortunately lengthy summary covers the main features dealt with in the F.A.O. Report.

#### *Ireland:*

Coming now to Forestry in Ireland, I suppose the most noteworthy development we have seen in the last 12 months is the drive for private planting initiated by our very energetic and enthusiastic Minister for Lands. This is something that members of the Society have long awaited. It is safe to say that we are 100% with this drive and it is more than a coincidence that the two lecturers appointed by the Minister to bring the light of Forestry knowledge to the less-forested parts of the Irish countryside, are both men who have been outstanding in this Society from its very beginnings. I refer of course, to our tireless Secretary and Treasurer, Mr. T. Clear and our valued member and several times President, Mr. Fitzpatrick.

The private planting drive is being handled with imagination and enterprise. The raising of the planting-grant from £10 to £20 per acre should certainly encourage any owner of a piece of suitable land and in many cases the grant should cover the major portion of the planting costs.

The coloured leaflet published by the Department entitled "Plant for Profit" should appeal to the long-term business instincts of any farmer who reads that an acre of Sitka spruce properly planted and managed should produce some £1,270 worth of thinnings and mature timber over a 45-50 year rotation. Or if the same farmer had been listening to Mr. Childers during the debate on the Forestry Estimate in Dáil Éireann in June last, he would doubtless have been interested in the possibilities of poplar-growing with a return of £600 per acre in 20 to 30 years.

An indication of the Minister's earnestness in pushing the scheme was his assurance at a public meeting in Dublin that if there was an insufficiency of suitable plants forthcoming from the nurserymen, then he would endeavour to meet the deficiency by curtailing the Department's own planting programme and supplying the necessary requirements from State Nurseries.

The great need for the Private Forestry drive is highlighted by such facts as that the total area of private woodlands to-day is somewhere around 90,000 acres while a mere 80 years ago it was 380,000 acres.

The second item which comes to my mind is one of special interest to State Foresters, namely, the introduction in April 1958 by the Minister for Lands of the Incentive Bonus Scheme for Forestry workers. Initiated at Blessington and Hollywood Forests, the aim, I understand, is to have the Scheme worked out in detail for each Forest in the Country on a basis of output and quality of work. I have been in a number of forests recently where the scheme is in operation and am able to confirm that the workers can, in fact, earn an extra £1 to 30/- each week. Naturally, like all innovations, there have been teething troubles and some foresters expressed doubts as to its worability etc., but the fact remains that it *IS* working and that a reasonably good wage can be earned by extra effort, hand in hand with an increase in output.

The Scheme was planned by industrial efficiency experts in consultation with the Department and with the trade unions concerned, and it was estimated that it would take two years to have it working in all the forests.

I can be forgiven, I think, for regarding the Annual Study Tour of the Society as one of the highlights of 1958. The attendance at Wexford was good, though not a record, but the organisation and the programme were excellent. I take this opportunity of congratulating and thanking all the members of the Outings' Committee on doing a very fine job. While the Curracloe plantations never fail to interest foresters and while the other local centres visited kept the programme at a high level, I am of the opinion that the display of mechanisation in the nursery at Clonegal was an effort which was fit to compare with some of the best demonstrations seen by the Society in their travels.

An important decision was taken by the Forestry Department during the year, one in which I had a close personal interest. This was the decision to depart from the normal and, I suppose, time-honoured Silvicultural practice in regard to the utilisation of mature and semi-mature Larch and Scots Pine Stands. Instead of carrying out periodic thinnings to bring about a final crop of heavy stems for sawmilling, it was decided to clear-fell in certain areas and, in the ensuing classification of produce, quite a large number of poles were made available for the Department of Posts and Telegraphs and the E.S.B. As one gaining his livelihood in the latter organisation, I am naturally "all for" putting money into circulation at home and reducing our imports from the Baltic, but as a forester I have to hang down my head (in the words of the immortal lyric), so as to avoid the accusing gaze of men whom formerly I called my friends!

I am assuming that all the unfavourable possibilities (especially that of wind-throw) were taken into consideration before the clear-felling policy was decided on and I am well aware that many of the older



stands of larch are not really improving with age, but are losing an increasing volume of timber each year, with the growth of butt-rot.

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A report of particular interest to Forest Pathologists is that the Dutch Elm Disease has been observed in this country for the first time. I understand that a Mr. Heybrook of Holland found examples of this disease while travelling in the vicinity of Kill, near Dublin, in January 1959. This brings to my mind a news item of February 2nd last to the effect that a Chair of Forestry is being established at the National University. This is a very welcome and progressive step in connection with Forestry at the highest level. It is high time that the decision was made to re-establish this post which was last occupied by the late Professor Henry.

An item which recently caught my eye in a Trade Journal was that the first consignment of packaged timber to come to this country arrived about January or February last. This innovation, which has recently been on trial also in England and elsewhere, consists in shipping sawn timber from the Baltic in bundles of perhaps 1 ton in weight, bound up with metal bands. These bundles can be very quickly hoisted out of ships' holds and either loaded directly on to lorries or stacked neatly on the quayside until further movement is required—usually with the assistance of fork-lift equipment.

Another item which interested me was to hear that C.I.E. are looking into the possibilities of using home-grown sleepers. Certainly, home-grown Scots Pine sleepers, if available in any quantity should be as good as French maritime pine, if not better. This very matter was recently brought up at a meeting of the English Timber Merchants Association in London and as I understand that the Native Timber Merchants Federation in this country is being re-organised, their aims will certainly include efforts to extend the uses of home-grown timber by all possible means. I should mention that the Electricity Supply Board have, as is only natural, a definite policy of using home-grown timber as far as possible. Tool handles, which it was once thought could only be satisfactory if made from American Hickory, are now almost invariably purchased in Irish ash. These handles are for such items as axes, sledges, hammers, slash-hooks, rammers, shovels, etc.

A Government decision which I personally thought surprising was the arrangement which gave a monopoly for the export of veneer timber to a firm based outside the Country, but I assume that the best available advice was taken on the matter before the decision was arrived at.

Finally, to keep myself from occupying the floor all night I will briefly summarise the work of the Department of Lands, Forestry

Division, for the 1957/58 period, that is to say, up to 31st March, 1958.

The total number of Forest units was 176, including 3 centres opened during the 1957/58 period (Ardara in Donegal, Swanlinbar in Cavan and Castlegregory, Co. Kerry).

The total area on hands was 365,230 acres, of which 310,892 were considered as productive forest. The total area planted was 257,467 acres and the plantable reserve 53,425 acres (the Minister for Lands, when taking over an area of 520 acres at Tourmakeady, stated that the plantable reserve was at a dangerous low level and that an increase in the acquisition rate was contemplated.

The area acquired in 1957/58 was 26,345 acres of which 23,268 acres were productive.

20,056 acres were planted in the period while the programme for the present year 1958/59, is 22,500 acres. There are 62 Forest Nurseries totalling 657 acres in area. The percentage of the different species planted during the year were:—

Sitka spruce ... ..	43.2
<i>Pinus contorta</i> ... ..	30.2
Norway spruce ... ..	9.0
Other conifers ... ..	7.9
Other pines ... ..	6.7
Broadleaved species ... ..	3.0
	100.0

The total number of plants used was 28 million. Employment given ranged from a minimum figure of 4,610 to a maximum of 5,019, the average being 4,835.

294 fires were reported during the period of which 22 caused damage amounting to £5,226 on a total area of 111½ acres.

The produce from thinnings in State Forests in 1957/58 was 2,068, 059 C. ft. The gross expenditure on forestry was £2,087,412 and the income £331,966 showing a net expenditure of £1,755,446.

If the present annual tree-planting rate can be maintained, it is estimated that State Forestry will give employment to 6,000 by 1968 and to 9,000 by 1978.

Many members will have noticed the widespread activity in road-making through the country's forests. In 1957/58 the Department laid down about 250 miles of forest roads and spent £195,000 in wages alone for this work.

In conclusion, I would like to thank the Council members, both those of last year and those incoming this year, for their splendid help and co-operation at all times. Judging by my experience of the new Council so far, we shall have a very successful year.

*Public Business.*

After a short interval the public part of the Meeting began with a lecture on "Imminent Management Problems in Scottish Forestry" by Professor M. L. Anderson, Department of Forestry, Edinburgh University. The text of the lecture appears elsewhere in this issue.

*Discussion and vote of thanks.*

Opening the discussion Mr. K. F. Parkin said that the Management problems facing the foresters in Northern Ireland were substantially the same as those outlined by Professor Anderson, for in the past the same pattern of planting large acquired areas over a short period had also been followed.

"With a measure of relief," he said, "I can confirm that his recommended policy of converting these areas to normal forests by an early start to clear felling of annual coupes equivalent to the total forest area divided by the average rotation, is being practised.

"The current establishment policy for newly-acquired forest areas, is not, however, in agreement with Professor Anderson's recommendations and since this policy was laid down after very careful consideration I think it may be of interest to briefly summarize it and to attempt to justify the departure from the silviculturally ideal management.

"As each new forest unit is acquired it is planted up in equal annual areas over a period calculated as that between the start of planting and the start of first brashing—usually 12 to 14 years. The resulting forest does not, therefore, have a normal distribution of age classes and future management problems will undoubtedly be encountered before a state of normality is reached in the second rotation. Such a policy is considered justified by the importance of providing as much rural employment as possible at the present time and also of rapidly building up an invaluable source of raw material for new industries on the land acquired for forestry purposes.

Professor Anderson's proposals to maintain a 60 year reserve of plantable land would mean that the present Northern Ireland annual planting programme would be reduced from 4,500 acres to 700 acres with a consequent severe drop in the permanent labour force, and the ultimate afforestation target would not be reached for 140 years.

"In our opinion the eventual, temporary management difficulties arising from the present afforestation policy in Northern Ireland are well justified by the immediate social and economic advantages.

"Once again Professor Anderson has demonstrated his unsurpassed theoretical and practical forestry knowledge in accurately pinpointing the problems ahead of us and in guiding us along the paths we should take. On behalf of the members of the Society of Irish Foresters I would like to propose a vote of thanks to him for this further contribution to forestry knowledge and for honouring us with his presence here to-night."

Mr. T. McEvoy.

In seconding the vote of thanks, Mr. McEvoy said that this country was fortunate to have had the services of Dr. Anderson (as he then was) at a critical, formative period in the development of the Forestry Division.

After a brilliant scholastic career culminating in a D.Sc. at Edinburgh he served with the British Forestry Commission in the early twenties, doing valuable pioneer work on sample plots, yield tables and silvicultural research. He came to Ireland in 1926 as Forestry Inspector but returned to higher duties in Britain in 1928—including lecturing at the Imperial Forestry Bureau at Oxford.

When A. C. Forbes, the first Director retired, Dr. Anderson was again called in as Chief Inspector in 1932, becoming Director in 1940. In 1946 he was again attracted to Oxford but soon moved to the Chair of Forestry at Edinburgh where his combination of academic distinction with vast field experience was particularly welcomed.

He exerted an abiding and distinctive influence on Irish Forestry, especially in such matters as the use of *Pinus contorta* here as a pioneer species before its virtues were recognised elsewhere, in the group planting of hardwoods and in the development of thinning techniques.

But in the long run our greatest debt to him might lie in his initiative in establishing in 1941 the Society of Irish Foresters as a forum for the independent development of Irish forest thought. As first President, as Editor, Councillor and Excursion Convenor he had left an indelible mark on the Society which had flourished with remarkably little change in the original mould of its Constitution and activities.

Referring to Prof. Anderson's paper, Mr. McEvoy thought all would agree with him in stressing that sound silviculture of the individual stands which comprise a forest must be practised within the framework of a proper management plan for the forest as a whole and that such plans should be evolved as soon as possible. Differences of opinion would be concentrated on the silvicultural basis on which the plan should be built, and on the practicability of a rigid application of his prescription for establishing a normal distribution of age classes.

One of the great difficulties in preparing a plan was the comparative paucity of silvicultural experience and the resultant violent swing of silvicultural fashions. There was little general agreement as to appropriate length of rotation or even a choice of species and rates of growth for many sites. Under such conditions it would be difficult to justify any rigid definition of areas into 'productive' and 'protective' forest, or the non-planting of large areas of land on hands in the interests of a highly theoretical concept of what would eventually emerge as a 'normal' forest. Fortunately we in Ireland did not have to consider the ills resulting from the planting of vast areas in one location over a few years. The pattern of piecemeal acquisition ensured a fair distribution

of age classes and a wide variation of site quality allowed of considerable room for manoeuvre by varying rotation lengths. It was surprising that Prof. Anderson did not mention the device of varying thinning intensities with especially heavy thinning in the older crops on the best sites as a means of hastening the approach to 'normality'.

Prof. Anderson rightly regarded a stable forest population as essential to a stable healthy forest but this did not prove a case for normalising in blocks of as little as 1,500 acres. To-day workers were far more mobile than formerly; they tended more and more to live in the nearest village and the unit for steady annual employment to be achieved by normal age class distribution could be much larger. Nevertheless the speaker agreed with Prof. Anderson that it was impractical to think in terms of normalising age class only on a regional or national basis.

While a case might be made for the wider use of slow growing native species in Eastern Scotland we could not claim any marked success here with, say, Scots pine; and we were forced for ecological as well as economic reasons to rely on fast growing American exotic conifers and therefore to think in terms of short rotations under which regime normality might be more quickly achieved if not maintained.

*Mr. N. Morris.*

Mr. Morris, in associating himself with the vote of thanks, was inclined to question whether the classical ecological approach to forestry was appropriate to modern conditions. He felt that with the present necessity to have more direct control over production we would find ourselves being forced increasingly to a system of artificial tree farming, with increased use of fertilizers, as in agriculture.

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## **Fifteenth Annual Study Tour —**

Denmark : 15th-30th May, 1959

### *Introduction.*

36 members of our Society travelled from Harwich to Esbjerg in Denmark on May 24th on this our fifteenth study tour. We were met on arrival in Esbjerg in the early afternoon of May 25th by Mr. Steenstrup of the Danish Heath Society and Mr. Tolstrup of the Danish Forestry Society and having boarded the very comfortable Copenhagen bus which Dr. Sabroe had arranged to meet the boat we started our 140 mile drive through Jutland to Viborg. On our way we were introduced to the work of the Danish Heath Society which was founded in 1866 and has been doing such important work since then in sponsoring, assisting and initiating the reclamation of the Heath lands of Jutland.

100 years ago 2,100,000 acres was covered with heath and to-day the heath area is less than 430,000 acres. In the meantime the land has been drained and reclaimed for farming, plantations have been established, 25,000 new homes have been started, the population has increased and towns and villages have prospered. The result of the work already done was to be seen all around us in the tidy well cultivated farms, the comfortable looking farmhouses, well constructed out-offices and shelter belts which were a feature of every farm. At Slauggard we stopped for a short time to enjoy a very refreshing cup of tea at the home of Forest Officer and Mrs. Beck and to eat quantities of lovely Danish savouries, sandwiches and cakes which Mrs. Beck had kindly prepared for us. That night in Viborg in the pretty setting of the Salonen Restaurant we were the guests of the Danish Forestry Society for dinner and had the honour of meeting Count Moltke, President of the Society who formally welcomed us to Denmark. On the following night the Danish Heath Society were our hosts with the Chairman of the Society presiding. The first two days of our tour were spent in the Viborg area of Jutland. As well as the work of the Heath Society we saw the work of the State in mixed heath planting on poor soil under the direction of Forest Officer Hviid, who, as President of the Danish State foresters, was our host at lunch in the very pleasant surroundings of Knudstrup Inn. We had an interesting afternoon in the Kongenshus Memorial Park which was established in honour of the pioneers of the Heath. The memorial stones which commemorate the reclamation of the heath demonstrate very strongly the great pride of the Danish people in the development of their country. We were sorry when we parted with our friends of the Heath Society and with Mr. Tolstrup who left us at Horsens. On the first few days he travelled with us on the bus and was our guide, philosopher and friend who answered our many questions cheerfully, joined in our jokes and made us feel at home from the moment of our arrival in Esbjerg. Mr. Elmquist took over from Mr. Tolstrup and in the same way helped us with our problems and answered all our questions. He remained with us until we came to the "Small Belt Bridge" on our return journey to Esbjerg.

Meeting Dr. Sabroe again was a great pleasure for all of us and it was typical of him that he did not allow a serious illness from which he was convalescing to prevent him conducting us personally around his own territory—the Boller State Forest district. Without Dr. Sabroe our visit to Denmark would not have been possible. It was he who arranged everything, our itinerary for the week, our hotels, meals and transport and he left nothing to chance. Mrs. Sabroe was also at Boller to greet us, to extend to us the hospitality of the Sabroe home and of their holiday cottage overlooking the sea near Horsens, where on a perfect summer afternoon we enjoyed a delightful cup of tea in the gardens beside the sea shore. The day we spent with Dr. Sabroe was one of the

most memorable of the tour. In the forest we saw very fine stands of broadleaved trees and natural regeneration of beech and fir. We paid a short visit to a modern highly developed Danish farm as well as the homes of a Danish State Forester and a workman. We also had an excellent lunch at Faddegrav Badehotel at which the Directorate of State Forestry was our host with Dr. Sabroe presiding. Our Society is deeply indebted to the Sabroes for planning such a wonderful tour for us and for their kindness and hospitality to us.

Another visit to remember was the visit to Mr. G. Larsen's estate at Kojkol near Horsens. Mr. Larsen journeyed specially from Copenhagen to meet us and to be our host at supper. His large estate with its acres of woodland and its lovely gardens was much admired by all of us. We also had an interesting day at Frizsenborg on the estate of Count Wedell. The Count and his Manager, Mr. Lovengreen, came around with our party and the Count, with typical Danish hospitality, entertained us to lunch. Our over-night stay at Horsens was unfortunately too short to permit of our visiting any of the interesting shops, but we admired the lovely varieties of flowers we saw there.

The last two days of our tour were spent in the island of Fyn which we reached by crossing the "Small Belt Bridge" at Middlefart. Here we saw the beautifully situated forest of Langes which surrounds the lake of the same name. We spent an afternoon in the Brahetrolleborg forest district owned by the Reventlow family, which has been in that family since 1700. We were told that it is one of the oldest research areas in Europe. A stop overnight at Odense allowed us time to see the famous Hans Andersen's house and to dine at one of the old world restaurants of the city. There was also the very fine park to see and many fine buildings. Faaborg, on the Baltic, our last stopping place, was a delightful seaport town with its houses built close to the quays. We did our souvenir shopping here and some of our party enjoyed a walk by the sea. Next day we saw Frederiksgave Castle estate and Forest Officer Qvistgaard showed us plantings of exotic trees on poor sand soil. We had lunch at a very pretty restaurant at Wedellsborg on the Baltic on the guests of the estate before starting on our journey back to Esbjerg.

We had ideal weather during the entire week and our memories of Denmark will be of a country of sunshine, of neat, comfortable farms, each one with its shelter belt, of bright cheerful, prosperous towns and highly developed forests. Above all, we will remember the hospitality and kindness shown to us, the courtesy, the friendliness, and the warmth of the welcome we received. Our bus driver from Copenhagen must not be overlooked. His skill and competence in steering his bus over the narrow roads in the forest were the envy of all of us and his little speech before he parted with us was in keeping with his courtesy, good humour and helpfulness during the week.

S. C.

Monday, May 25th:

The drive to Viborg allowed the members to become familiar with the sight of unfenced lands, tilled or meadowed to their exact borderline, and to appreciate the care with which shelter screens of trees and shrubs had been grown so as to shelter the countryside and buildings in an orderly fashion. Belts of spruce (*Picea alba* and *P. sitchensis*) were frequent, but wherever possible hardwoods of the whitebeam, elm, or sycamore types had been used.

The journey was broken by a number of halts. The first of these was in an 80 year old stand of Norway spruce of slow growth, which is being opened out and underplanted with silver fir and Douglas fir with some *Quercus borealis*, beech, and Japanese larch. The slow development of the spruce was attributed to lack of moisture and a shallow root system. As the soil consisted of a deep, free-working sand it was felt that the deeper rooting species would be able to forage more successfully for water and that the overstorey of spruce should abate the effects of drying winds until the new crop was well established. The most successful results appeared to be in areas where there had been *Quercus petraea* scrub on sandy heathland. Birch was common in the second crop regeneration areas.

The discussions were enlivened by refreshments provided at the halt, and members were able to examine the use made of granite boulders set in formal groups. The names of pioneer heath planters were engraved on the stones as a permanent memorial.

The next item was a reception at his beautiful official villa by Chief Forester Beck, who has charge of a farmers' co-operative forest. The house was set in a clearing of several acres at the meeting point of several wide rides through a heathland coniferous forest: groups of hardwoods and ornamental conifers relieved the austere lines of the forest and protected a collection of flowering shrubs. The vistas along the open rides gave a sense of spaciousness, and crops grown in them a sense of agricultural prosperity. The traditional style of roof, with wide eaves over half timbered walls repeated some of the typical shapes and dark brown tones of the forest, and these in turn provided the background for brightly coloured flowering creepers and late spring flowers.

Mr. and Mrs. Beck's kindly welcome was greatly appreciated and Mr. Mangan expressed the thanks of the members.

The last portion of the journey was through the scenically undulating Dollerup Hills, south of Viborg. This is a favourite tourist resort, and a system of roads, adequate for a heavy stream of traffic winds up and down through stretches of unaltered heath which support the full flora of the type, and picturesque woodlands on the slopes overlooking beautiful lakes. A brief halt was made to allow time to enjoy the view and to examine the vegetation in which species of the typical genera, rare or absent at home, were common. *Vaccinium vitis-*



*idaea* for example, and near the forest edge *Trientalis europaea*, but with a thin growth of *Calluna* dominant.

J. E. J.

### Tuesday, 26th May.

The forenoon was spent in the 6,000 HA State Forest of Viborg under the guidance of Forest Officer Hviid, who told us of the many problems of his charge. Not the least of them is fire. "There has been one fire this morning," he announced on our arrival, "so no smoking please." In 1948, 1,300 HA was burned by an unexploded shell which had lain in the woods since the war, and the fire station adjacent to the forester's house was a reminder of the danger.

We looked at a soil profile pit opened on the summit of an unplanted ridge and heard something of the history of the area from Mr. Hviid. When an ice cap covered all the rest of Jutland during the Ice Age here there was no ice. The nearest glacier was 10 miles to the north and during successive summers the melting ice waters poured over the place where we were standing and washed the mineral nutrients out of the soil. What was left was a barren sand, very low in humus, which supported no plant life except a thin crop of heather. "On this spot," said Mr. Hviid, "there has certainly been no forest for 1,000 years as we know it was the site of a battle in 1100 and for that a pitch clear of trees would have been chosen."

There are now 2,600 HA of forest in this section. The first planting was done by the State in 1804 and continued until 1840. Scots pine was used and it suffered severely from leaf shedding due to *Lophodermium* and the plantations were a failure. Norway spruce was then tried and it failed too and the scheme was suspended until 1895 when it was started again with the benefit of the experience gained by the Heath Society on similar land.

As well as fire and poor soil conditions, the management has to contend with drought in years of low rainfall, late frosts nearly every year, windfall and *Fomes annosus* in the shallow rooting Norway spruce and deer damage to the firmer rooted and healthier silver fir. An interesting technique has been evolved to combat all these drawbacks and this was explained to us by Mr. Hviid whose staff gave demonstrations of the actual operations which have led to successful afforestation.

The modern method is to plough 45 to 50 cm. deep with a mounted plough during the summer, disc harrow in the autumn and plant the following spring. About 1 ton of ground lime is spread over an acre in addition to 4 cwt. of a mixture of Phosphate, Potash and Nitrogen fertilizer containing some trace elements and after planting is finished 14 cwt. of rye straw is scattered over the surface of the ground with the object of providing humus. The total cost of the preparation, including fencing against deer, is up to £80 per acre.

We saw a demonstration of planting by machine. A large tractor

pulled a three row planter which seated three operators who planted Norway spruce, Lawson cypress and birch 2 year 1 year transplants at  $1\frac{1}{2}$  m. spacing in lines  $1\frac{1}{2}$  m. apart. The machine opened a furrow into which the operator thrust a plant; the soil was filled in by a disc and firmed about the roots by a narrow roller.

Nearly all the mixtures contain 50% Norway spruce which is found to be a valuable cash crop, first as Christmas trees from 10 years of age and later as fencing posts and rails, hay tripods, transmission poles and construction timber. There is an established market for the spruce and it is easier to sell than Japanese larch, Douglas fir, silver fir, or mountain pine. Japanese larch is used for its beneficial effect on the soil and because it helps the growth of the spruce. It is well liked for mixing in the fire and shelter belts which border the roads. These are 35 yards wide and besides Japanese larch and spruce contain silver fir, oak, beech, sycamore, cherry (*Prunus serotina*) and *Amelanchia spicata*. The aim is to smother the grass and heather as soon as possible and to maintain a green understorey of non-inflammable hardwoods and shrubs. To speed the early death of surface vegetation the ground in between the lines of newly planted trees is kept cultivated by a small four-wheeled tractor carrying a spring tined harrow. Killing the grass also reduces the frost danger.

Points of interest which came out in the course of the many discussions were :

Fertilizers are of little value on the unimproved sandy soil as they are washed out because of the lack of humus. They rye straw provides humus and they find that there is a noticeable improvement in fertility when soil is brought from older plantations and shovelfuls are sprinkled over the straw. A zoologist from the nearby concientious objectors' camp has found earthworms in a straw strewn plantation and Mr. Hviid hopes that the straw and soil treatment will lead to an increase in the numbers of worms—"the unpaid tillers of the soil."

Silver fir is protected against deer damage by "twinning" with mountain pine or alder. The two species come from the nursery tied together with string and they are planted in the one pit. They grow up side by side and the nurse is not removed until the silver fir is in need of relief—usually it is not necessary to remove it at all.

The roads and fire-lines divide the forest into compartments of about 500 acres.

The forest workers are able to earn 30 kroner a day on piece-work and take home £7 10s. 0d. to £9 a week.

The rotation of Norway spruce depends on the soil. The first generation was left for 60 to 70 years which is equivalent to 45 years growth allowing for initial checks.

We had lunch in Knudstrup Inn as guests of the Society of Danish State Forest Officers. Mr. Hviid who is president of the Society was our

host at a most enjoyable meal in a room appropriately decorated with sprays of tree foliage by the local forestry staff. Mr. McEvoy expressed our thanks for the hospitality and we then set out on our afternoon session visiting the woods in the charge of the Danish Heath Society.

The Danish Heath Society is a non-profit-making body whose aim is the improvement of the soil of Denmark. It has 19,000 members and its headquarters is in Viborg. It is governed by a committee and a board of 9 directors, 4 of whom are elected by the Committee, 3 by the Ministry of Agriculture, 1 by the farmers' associations and 1 by the small holders' association. It was founded in 1866 when there were 1,000,000 HA of uncultivated heath. Since then 700,000 HA of this area has been converted into arable land, the society has assisted in establishing plantations with a total area of about 100,000 hectares and the Government through the State Forestry Department and the Dune Directorate has planted another 90,000 HA of plantations.

From 1880 the State granted annual subsidies for the work of planting. A few years earlier the planting of shelterbelts and small plantations was commenced and from 1882 the work of planting shelterbelts was organised in local societies which are enabled by the State grant to distribute trees at reduced prices.

The Society has assisted in the establishment of about 3,100 plantations occupying about 270,000 acres of which 30,000 acres belong to the Heath Society itself.

As we drove along towards our first stop to right and left of the road we saw evidence of the Society's work. It was hard to realize that 100 years ago these prosperous farms had been barren heath and that the transformation had been wrought by deep cultivation, marling and by the planting of shelter belts. Colonel Dalgas, the founder of the Heath Society and its director during its early years, first hoped for sufficient shelter from widely spaced belts but before long he realized that high production was not possible without close shelter and that this was achieved by single rows of trees around the fields. Now every field has its high "hedge" of Norway spruce mainly about 20 to 30 feet high and in nearly every instance in a single row.

And then we came to Kongenshus Mindelpark, a 3,000 acre memorial park to the pioneers of the heath reclamation, and drove into one of the long shallow valleys along a narrow road flanked with boulders set up in commemoration of the work done in improving the heath lands since 1866. Each district has a boulder and on it are carved the areas of heathland, woodland and farmland in 1850 and in 1950, and round each district stone are smaller stones for every parish bearing the names of the local heath pioneers.

Shortly after leaving the memorial park we entered Guldborgland plantation, which is the property of the Heath Society. We were welcomed by Mr. Christiansen who presented each of the ladies in the party with a bouquet of flowers. He explained the problems of the

area under his charge which extends to about 1,000 acres of Norway spruce planted in the heather from 1875 to 1885 and now undergoing regeneration. Clear felling is not favoured as it leads to the growth of a dense mass of grass and gives no protection against frost or the drying effects of sun and wind which are serious on the sandy soil and with a rainfall of only 25 inches. The system found successful is artificial regeneration in narrow strips under a light shelter-wood, planting a mixture of Norway spruce, *Abies grandis*, silver fir, Douglas fir, Japanese larch and birch. In some compartments the birch (*Betula pubescens*) and silver fir were planted in the same hole so that the birch would protect the fir against roe-deer. Every plant was given  $\frac{1}{2}$  oz. of a mixed fertilizer at the time of planting. Ploughing before planting is usual.

We were given this data for Compt. 25 :

Species	...	...	Norway spruce.
Age	...	...	88 years.
Total increment (1955)			9,900 c.ft. per acre.
M.A.I.	...	...	128 c.ft. per acre.
Volume in 1955	...		5,200 c.ft. per acre.

Over half of the stems in this plantation suffer from *Fomes annosus*. About 3 feet to 6 feet of the butt of affected trees is unsuitable for saw timber and goes for firewood or pulping.

Heaps of Norway spruce poles were seen on the roadsides. Felling and extraction are done by the forestry workers, who measure the logs and mark the dimensions on the butt of each. Standard prices based on size classes but not quality are agreed at an annual meeting of timber merchants and these prices are a guide in all the sales which take place during the year.

Our next stop was at Dalgas Plantation, an area of 1,050 acres called after the founder of the Heath Society, which was planted from 1887 to 1930. We looked at Compartment 43 dating from 1894 when a mixture of 75% Norway spruce and 25% mountain pine was planted on trench ploughed heath. Seven years later the furrows were ploughed back against the plants because they showed signs of ill health and later all the mountain pine was taken out. In 1955 the Norway spruce was 40 feet high and volume 1,900 cubic feet per acre. 80-90% of the stems were attacked by *Fomes annosus*.

The area is now under regeneration. The general plan is to work from east to west clearing strips 8 metres wide with 16 metres left in between. Stumps are removed and the entire area of the strip is ploughed and planted with a mixture of Norway spruce, Douglas fir, silver fir, and Japanese larch. Trials are, however, made with other methods—one area had two-thirds of the trees cut out and the

remainder retained as an overstorey. The branches were collected in windrows and the spaces in between were ploughed by horse plough. Birch seed was sown in the furrows, and a mixture planted consisting of 50% silver fir, 34% Norway spruce, 8% Douglas fir and 8% Japanese larch and in the following year  $\frac{1}{2}$  oz. of mixed fertilizer was applied to each plant. They plan to leave the overstorey for 10 years or until the young trees form canopy.

Points from the discussions—

In Denmark site quality classes are from I to VI. Dalgas plantation is on quality VI and the soil is a poor glacial sand with a pH of 4.6. By introducing soil improvers such as birch and Japanese larch they hope to raise the quality in the next rotation.

Mr. Christiansen said they had a "desert" climate in June and July—60° temperature by day and frost every night.

In reply to Mr. Clear, Mr. Christiansen said that clear felling and complete ploughing would be all right if the stumps could be easily removed.

H.M.F.

### **Wednesday, 27th May.**

The journey from Viborg South East to Frijsenborg Estate near Hammel where we studied forestry on this day was full of interest. Our friend and guide, Mr. Tolstrup, gave us many tit-bits of information concerning the district through which we travelled, and pointed out many items of interest to members. Along the route we saw several extensive commercial forest tree nurseries ranging from 50 to 150 acres and among them one owned and managed by the Danish Heath Society for the production of Norway spruce transplants for its more sandy northern forests.

The demand for transplants can be appreciated when one realises that half of Denmark's million acres of forest is in small plantations on farms of less than 50 hectares. Indeed, a feature of this district is the number of small farms which have their own plantations properly managed to provide much of the timber requirements of the holdings. Of interest too was a pig breeding station, and an artificial lake built about 30 years ago as a source of power for the production of electricity.

Count Tido Wedell, owner of the Frijsenborg Estate, met us at Hagsholm Forest and extended a warm welcome to the Society before handing over to his forest manager, Mr. Lovengreen, to conduct us on a tour of the forests. Throughout the tour Count Wedell accompanied us, entertained us to lunch and joined in discussions.

The Estate Forest area of over 4,000 hectares is evenly divided between hardwoods and conifers as follows :

<i>Hardwoods:</i>		<i>Conifers:</i>	
Beech	... 1,009 hectares	Norway spruce	... 893 hectares
Oak	... 439 "	Sitka spruce	... 356 "
<i>Quercus borealis</i>	72 "	Silver fir	... 450 "
Ash	... 186 "	<i>Abies nordmanniana</i>	139 "
Maple	... 40 "	Douglas fir	... 70 "
Birch	... 179 "	Scots pine	... 25 "
Alder	... 124 "	Japanese larch	... 171 "
Others	... 16 "	Others	... 40 "
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Total	2,065 "	Total	2,144 "

At present more than half the forest crop is less than 35 years old. This is due to severe wind storms in 1934 and 1937 when over 10,000 M<sup>3</sup> of timber was damaged, and to extraordinary heavy felling during the war years. Soil conditions vary considerably but on the whole the soil is good and conditions reasonably favourable for tree growth. The rainfall for the area is 660 mm.—the average for the country is 625 mm. but frequent and severe late spring frosts and prolonged summer droughts give the foresters many headaches and cause much damage to tree crops despite their best attention. Birch is extensively used as a nurse for the more tender species which cannot be grown successfully on exposed sites here.

First to catch the eye was a magnificent stand of *Abies grandis*, age 45 years, f.f. .425, h. 28.9 m. diam. 39.9 cm. No. 301, b.a. 37.6 and volume 462 M<sup>3</sup> per hectare. First treated in 1934, it had been thinned 11 times and had yielded 438 M<sup>3</sup> per hectare from 2,327 poles removed. Between 1934 and 1949 during which period it was thinned bi-annually an average of 12% of the crop was removed in each thinning. Since 1949 thinning was every third year and the cut was reduced to an average of 8.2% of the crop for each thinning. Mr. Lovengreen favours frequent light thinnings to produce big crowns and gross stems. This crop was the second rotation, the first being Norway spruce before which the area was covered with heather.

Next we saw stands of 48 years old *Abies nordmanniana* and 44 years old *Abies nobilis*—poor in comparison with the *grandis*. The *nobilis* stand had been thinned annually to provide Christmas decorations for which there is good demand at a remunerative price. A belt of 64 years old silver fir on the west and windward side of this conifer block was underplanted with beech in 1958. As the silver fir is regarded as a wind firm species it is planned to retain it as long as possible for protection and the beech is introduced to improve the soil and form an understorey. We wondered at the close spacing of the beech in the lines which were 6 feet apart, but only a few inches apart in the lines.

The Danes believe in close spacing of beech to get the best results. A stand of common oak underplanted with sycamore in 1942 was admired and discussed. Some members expressed the opinion that the sycamore would eventually outgrow the oak but Mr. Lovengreen plans to keep the sycamore as an understorey for the benefit of the oak only. The oak is now 47 years old; f.f. .606, h. 14.0 m. diam. 18.7 cm. No. 547, b.a. 15.1 and Vol. 128 M<sup>3</sup> per hectare. It has been thinned 5 times since 1931 and promises excellent results.

At Haurum Forest on the same Estate beautiful plantations of spruce and oak were to be seen. A 20 years old stand of Sitka spruce which was not yet pruned was receiving its first thinning. By our standards the thinning was light, but the felling and extraction to roads was extremely difficult in this thicket. Of particular interest was a plantation of Sitka spruce specially selected for seed supplies. Stems are now reduced to 300 per hectare and at 51 years old they are 30.5 m. in height. They are obviously classically bred and this is appreciated by the owner and forester. Here, too, we saw a stand of sessile oak from special (Spessard) seed now 45 years old and full of promise.

At Pot Molle, beech 60 to 80 years old was the attraction before driving to Sonderskoven where numerous interesting plantations of beech, silver fir, Japanese larch and Norway spruce were seen and compared. Members were surprised to see Norway spruce thinnings being prepared for transmission poles, but there is apparently a ready market for good quality Norway spruce for this purpose. An unusual method of protection against wind damage was the subject of a lively discussion at a 36 year old Norway spruce plantation. Some of the trees on the edge of the stand had been blown down during a recent storm making it more difficult now to protect the remainder of the crop. Realising that the wind was likely to penetrate deeper and deeper into the wood unless the trees on the fringe were kept standing, Mr. Lovengreen had several whorls of branches pruned from the centre of the crown of these trees, leaving the top and bottom green whorls untouched. In this way the area of crown exposed to the wind is reduced and the force of the wind gradually weakened. There is little light penetration to the forest floor and very little loss of increment.

A most instructive and interesting tour of Frijsenborg Estate ended at a 13 year old beech plantation which had been treated with artificial manures including Nitre, Potash and Phosphate. Growth is pretty even, and so far the experiment has shown little results.

Our President and Mr. J. Galvin thanked Count Wedell for his lavish hospitality, and for the great privilege of viewing his numerous excellent plantations. To Mr. Lovengreen and his able assistants, Mr. Norgaard and Mr. Graam, for arranging the itinerary, providing a wealth of information, and patiently answering questions words of appreciation were also spoken.

Travelling via Himmelbjerget we paused here to admire the scenery.

Here, indeed, trees have added much to the beauty of the landscape and it reminds one of how much remains to be done to improve our scenery, where we have lakes and hills in abundance in Ireland.

Driving through a community forest which is the property of local farmers our guide explained that it was managed as a single unit although the boundaries of each owner's plot are clearly demarcated.

Arriving at Hojkol, the residence of Mr. Gunnar Larsen—a familiar figure in Irish Industry—he invited us to have a look around the estate before entertaining us to supper. Here, too, we met Dr. Axel S. Sabroe so well known to our members and Mrs. Sabroe who also visited Ireland some years ago.

In extending a hearty welcome to the Society Mr. Larsen invited us to make ourselves "at home" which we really did, partaking of a substantial meal in the cool of the evening. Dr. Sabroe also spoke warm words of welcome, and apologised for being unable to meet us on landing in Denmark on Monday morning, being advised by his doctor not to travel.

The President and Mr. M. Flannery offered thanks to all concerned for the wonderful hospitality and kindness which we received.

The sun was setting as we left to continue our journey to Horsens where we stayed for the night. We were sorry to part with Mr. Tolstrup there after a perfect day.

D.McG.

#### *Thursday, May 28th:*

Leaving Horsens at 9.30 a.m. we soon arrived at Boller State Forest where Dr. Axel Sabroe was our guide for the day.

Boller was, until 1930, part of the great Frijsenborg estate. But after the death of the late Count it was sold to the State which divided the farmland into 18 acre holdings and took over control of the forests. When Dr. Sabroe took charge in 1935 he continued a system of silviculture more or less corresponding to the German *Dauerwald* ideas: thinnings were carried out every two or three years and slow, natural regeneration, especially of beech, was started. This proved very successful during the second World War when a good reserve of naturally regenerated material was found to exist under the old stands.

Figures for the forest are as follows:

Total area	...	...	3,458 acres
Total broadleaved trees	...	...	2,561 acres
Total coniferous trees	...	...	622 acres

Beech predominates among hardwoods and silver fir among conifers.

Average standing volume for all species was 2,415 cubic feet per acre in 1933 and 2,258 cubic feet per acre in 1948. The intention is to increase this to 2,800 cubic feet per acre.



Precipitation averages 28 inches per annum. The soil is rich, but in places too heavy. Chalk is abundant.

The first stop on the excursion was at plot No. 3 where we saw an excellent example of selection treatment with mixed hardwoods. Ash, beech and sycamore were the predominant species. A very excellent second storey of sycamore was of great interest as, even at an early age, one could see 15 to 20 feet of perfectly formed and clean stem in all dominants of that age group. All were allowed to come up at very close spacing, i.e. about 6 inches apart, and only after 6 to 7 years of intense competition was any thinning carried out and then only slowly. This area is an experimental one where Dr. Sabroe has carried out very careful and intensive treatment with excellent results.

Plot No. 16 being one of coniferous mixture of Douglas fir and western red cedar (planted 1951) gave rise to the question of mixtures of species. Dr. Sabroe, although in favour of mixtures, preferred the idea of grouping the species, e.g. a group of Douglas, another of *Thuja* and so on. For an eight years' old plantation the mixture showed good promise, and even the shade-loving *Thuja* was coming on well.

A plot of beech which in its early years, at the beginning of the century, had been seriously damaged by game was then shown to us. Although considered poor by Danish standards it would easily reach Quality Class II in Ireland. The quality of hardwood stands in most of the Danish forests was really an eye-opener for us.

We then visited a plot of beech where group regeneration was carried out. The beech standards are 145 years old, showing 30 or more feet of clean, first-class timber. In Denmark the trunk is sold as first-class timber for furniture, etc., the main branches may be used for floor blocks, and small lumber and the lesser branches are sold for firewood.

Further to this we visited Plot No. 294 where we saw selection treatment of ash, sycamore and beech. The first storey was ash, the second beech and the third sycamore. The combination, although not very outstanding does show the compatibility of these species with each other.

Our final wanderings of the day took us through "Grund" forest where another fine stand of beeches, 135 years old, was pointed out to us. This region is on the banks of the Vejle Fjord and yet the beech stems are very well shaped. Interesting to note was the absence of root competition with the second generation coming up which may have been secured by the gradual opening up of the stand, thus retaining the soil moisture more completely.

After driving through Ullerup forest we soon arrived at the Sabroes' summer residence where we had afternoon tea before heading over the Lillebaeltsbroen and on to Odense where we spent the night.

L. G.

Friday, May 29th:

This day we visited two forest areas, the first one being at Langesø. When we left Odense we met Mr. Elmquist who replaced Mr. Tolstrup as our travelling guide.

Langesø is situated a few miles to the north-west of Odense, and the forest area totals 1,895 acres. In 1958 the area under trees was divided among species as follows:

Beech	...	...	...	...	819 acres
Oak	...	...	...	...	142 acres
Ash	...	...	...	...	72 acres
Other hardwoods	...	...	...	...	90 acres
Larch and Douglas fir	...	...	...	...	154 acres
Other conifers	...	...	...	...	420 acres

The hardwood areas are often mixed with conifers which influence the form and growth of the beech. The mixtures have generally been achieved by underplanting in smaller groups and filling up beech stands damaged by mice and frost, the age difference between the beech and the after planted species being about 10 years. Many areas consist solely of conifers.

Stjerneberg, section 61 el: A fine stand of Douglas fir planted in 1883 in an open field at 3 × 3 ft. spacing. The idea, according to Mr. Marstrand Jørgensen, the forester in charge, is to retain the stand as long as possible. The present price for Douglas of that quality in Denmark is about 7s. per cubic foot, but even at that attractive figure the Danes are reluctant to fell. Whether or not they are carrying the stand beyond its financial rotation through overstressing the silvicultural aspect is a debatable point.

The importance of foliage as a marketable crop was one of the main features noticeable at Langesø. The sale of branches produces an additional income of about £5 per acre per annum.

The overall impression of our short visit to Langesø was one of a scientific approach to forestry with adaptation of the financial aspect to the silvicultural rather than *vice versa* as in Ireland.

After lunch at the Komigen Kro we travelled south towards Faaborg, stopping off at Brahetrelleborg estate, owned by Countess L. M. Reventlow, which is 3 to 6 miles from the coast north-east of Faaborg in the south of the Island of Fyn. Here oak and beech grow well. Conditions are poor for ash, and many trees show black seed at 25 years of age. Norway spruce is badly attacked by heartrot. Regeneration in beech is carried out partly by self-seeding and partly by planting, oak chiefly by direct seeding, all other species by planting.

In a visited beech plot the area was being prepared for natural regeneration. The stand has not been thinned since 1944 to prevent encroachment of ground vegetation which would hinder natural regeneration. When a good mast occurs the ground will be prepared by

a cultivation which will make strips 1 metre apart, then in the following winter the stand will be thinned.

Finally our tour took us to an oak stand severely defoliated by the moth *Tortrix viridana*. On these oak stems a large number of epicormic shoots have appeared due to the attack of the moths. Underplantings of lime, sycamore, ash and beech are used to retard the development of watersprouts, but here the attack was so heavy that the canopy had been opened up and in many cases stripped completely. Discussion of the situation followed, and the Danes, including Mr. Bistrup, forest officer, seemed rather reluctant to use insecticidal sprays for fear of harming other wild life and predators on the moths.

The night we spent in Faaborg, dining at Rasmussens hotel and thence wandering to our respective beds, scattered through three of the town's hotels.

L. G.

*Saturday, May 30th:*

After a restful and pleasing evening followed by a good night's rest in the ancient town of Faaborg on the Baltic coast, we headed north westward. An air of sadness prevailed—we were now commencing our last day; turning homewards, reluctant to leave Denmark and its friendly people.

After a pleasant run we halted at the Forest of Weddellsborg (Area 160 hectares). We were met by Forest Officer H. P. Ovistgaard who welcomed us and gave us a short history of the forest area. He pointed out that the strong winds from the south west were troublesome as the forest had a long boundary facing those prevailing winds.

The soil in the area is derived from a deep glacial deposit, rich and showing signs of careful management. Many broad-leaved species including oak, beech, sycamore, rowan (*Sorbus*) and ash are cultivated. Of the conifers Norway spruce, Douglas fir, *Abies alba*, Sitka spruce (and it was the first area with a plantation of *Cupressus Lawsoniana*) were to be seen. To an Irish Forester the absence of *Tsuga heterophylla* was noticeable.

Oak and beech are grown for veneer and fine stands of pedunculate oak of approximately 130 years were seen. Beech 160 years old was here too. The selected stems of the oak are kept pruned of water sprouts from June to September each year. The failure to carry out this operation in any one year would ruin the stem for veneer purposes.

The system under which these oak and beech are grown is a two storied and often a three storied forest. The first length of an oak grown thus and of first quality (about 10 ft. long) is valued at between twenty and thirty-five pounds sterling per cubic metre. The second length often obtained is valued from ten to fifteen pounds.

When growing oak of this quality the Danish Foresters aim at producing 14 to 16 sq. metres basal area per hectare at 50 years and to

maintain this basal area throughout the life of the forest. This includes the basal area of the second storey, usually beech, and the third storey, usually of sycamore. *Sorbus* and similar smaller trees are also used in this storey which forms a protection for the forest floor.

Green pruning of the spruce and Lawson cypress was practised to take advantage of the Christmas trade in greens and, to supplement the Christmas trees, for decorative purposes.

The use of branches and brushwood to conserve the moisture in the areas being re-planted or re-seeded was practised. Deer had caused damage in this area.

Absence of oak mildew was explained thus: "Oak likes wind: perhaps mildew does not like wind."

Reluctantly we left the forest, stopping to have our last meal on Danish soil at a beautiful restaurant on the shores of the Baltic. Farewells were made to our Danish hosts; our excellent Danish driver raced his bus against time over the Smaal Belt Bridge and on into Esbjerg and here we boarded the boat for home.

M. C.

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## **Forest Machinery Field Day**

The Society broke new ground when it organised, on May 2nd, a demonstration of forest machinery on a site kindly provided by the Earl of Meath on his estate at Kilruddery, Bray, Co. Wicklow. The day was a marked success, with fourteen firms exhibiting and demonstrating many varied pieces of machinery with uses in forestry. Each exhibitor was allocated two half-hour periods, one in the morning and one in the afternoon, for demonstration.

The field day was formally opened by Mr. Childers, then Minister for Lands, who spoke of the remarkable progress that had been made in recent years in the development of new and better types of machinery capable of dealing with a very wide range of forest operations, and of the enormous contribution which the use of suitable machinery could make to more economic and more efficient forestry. He congratulated the Society for arranging the demonstration and mentioned the encouragement and support given by the members of the Society in the campaign for more private forestry.

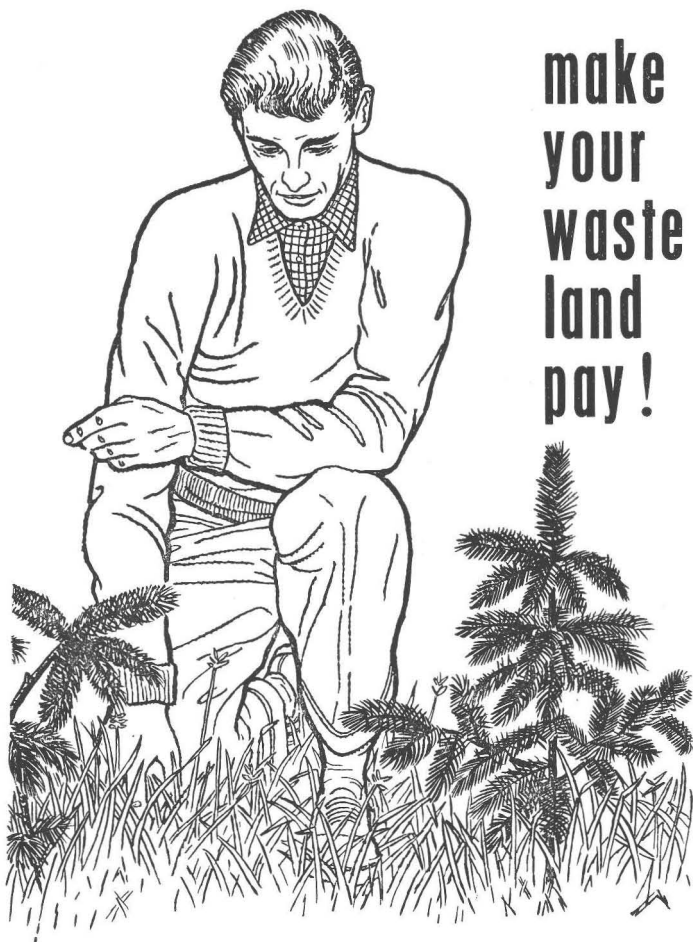
## **Advertiser's Announcement**

A new line of six McCulloch chain saws has been announced by R. Broderick & Sons, Ltd., 43, Dame Street, Dublin.

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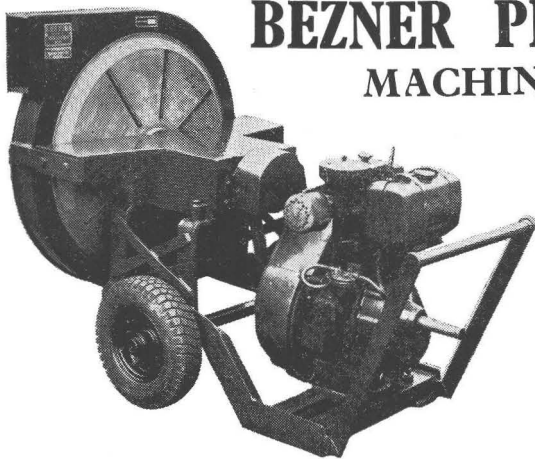
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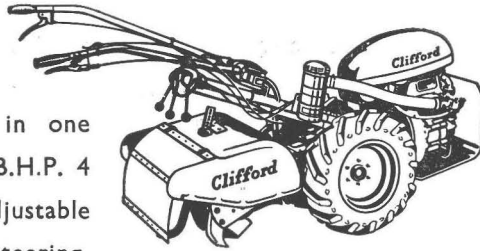
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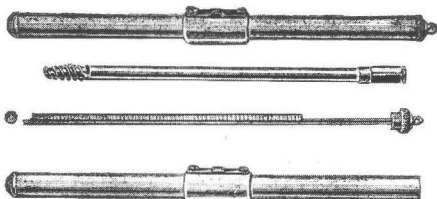
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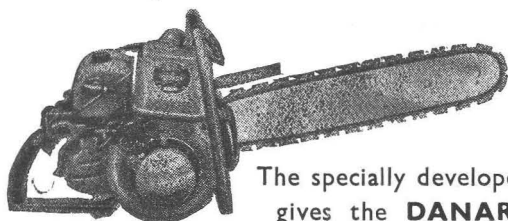
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