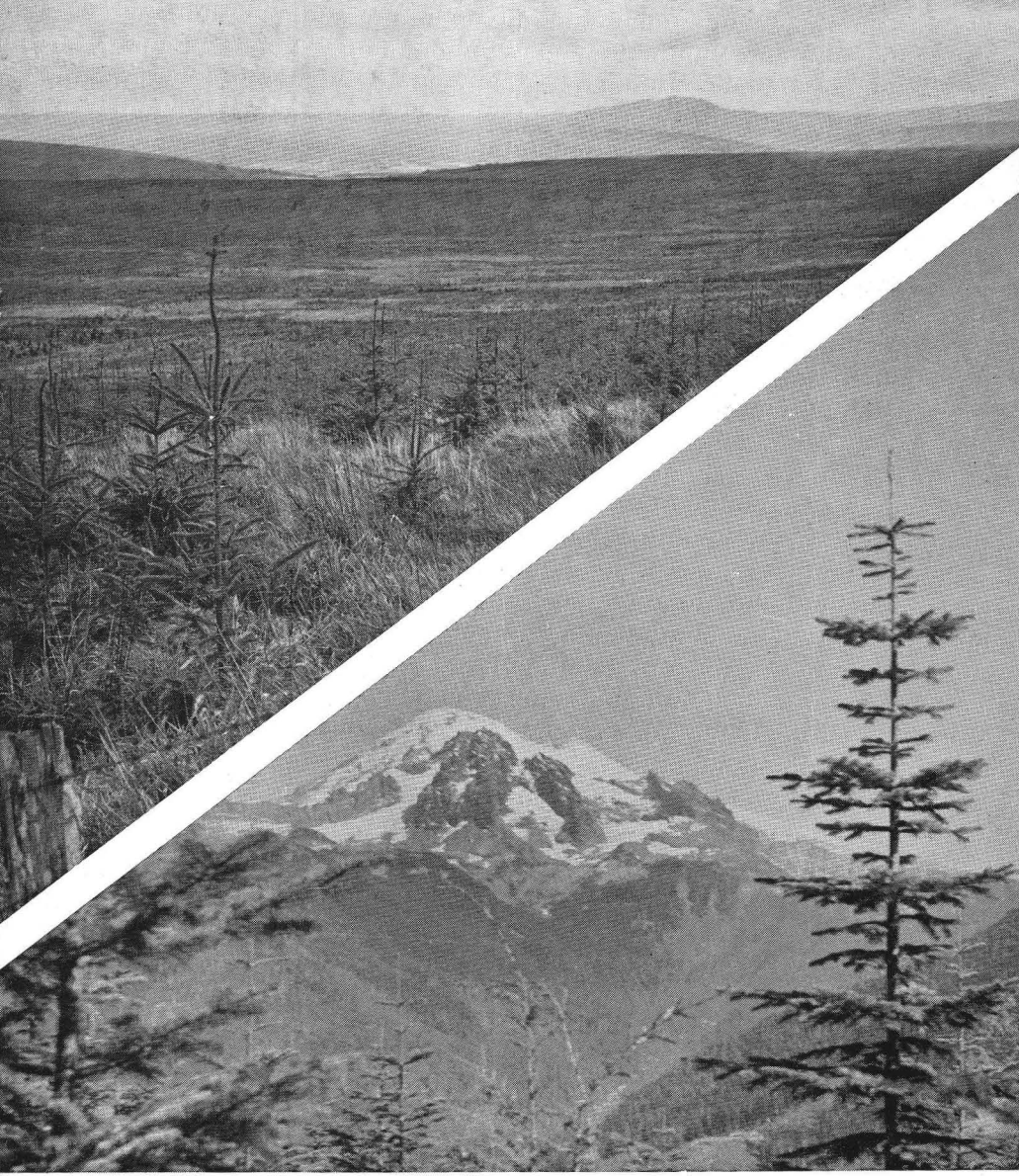

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Journal of the Society of Irish Foresters

Published Twice Yearly

VOLUME XXII No. 2 AUTUMN, 1965 7/6.

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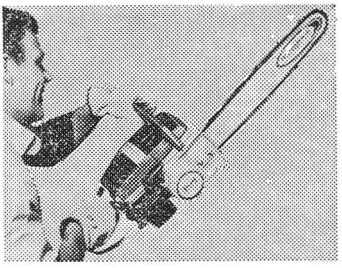

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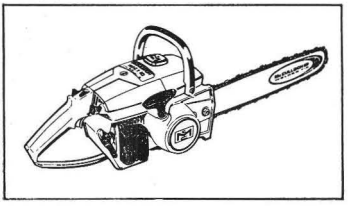

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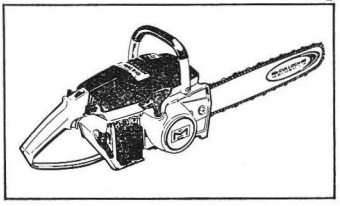

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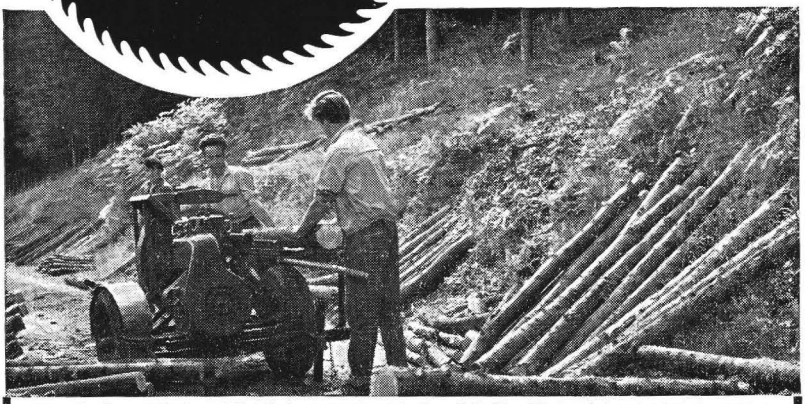

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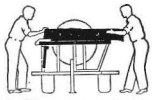

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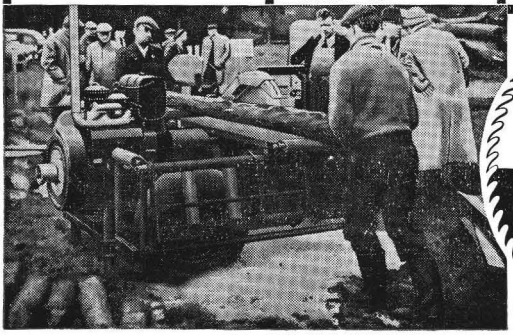
CROSS CUTTING



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(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.)

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IRISH FORESTRY

Volume XXII AUTUMN 1965 Number 2

Editorial

ONE of the problems of a Society like ours is that the members are spread far and wide. The only area where we have any concentration of members is in the Dublin region. This situation tends to lead to various unsatisfactory developments which are, in large part, and in the present organisation, unavoidable — i.e. diminished contact with country members due to a preponderance of those resident in Dublin on the Council, greater concentration of meetings in eastern regions, again due to a weight of members in the east, but resulting in reduced possibilities for participation in our activities by members in more remote areas. The overall effect of this is, naturally enough, to cause reduced interest, and perhaps a slight lethargy among those who find that their chances of participating in Society activities are remote.

We have felt a slowing of pace and want to know more about why this is so. You, our members, collectively and individually will be our advice. To this end we have decided to hold three pulse-feeling regional meetings this winter, in the south, the west, and the north. What we hope from our members is that as many as possible will attend and comment frankly on their feelings towards the Society and, having given the matter some serious thought, will also make suggestions for changes or improvements that might be made. We also hope that our members will bring as many non-members as possible to hear from them their views.

The more members we have the more the Society can do, and for a greater number. But we do need all our members — you — to be our physicians and to feel this pulse we think may be flagging. We need you to note the symptoms, pinpoint the causes and, above all, chip in. We have some ideas which should help to regenerate our Society, particulary in the areas more remote from Dublin.

These meetings will follow three interesting papers to be read at Cahir on February 5th, at Strabane on February 17th and at Castlebar on March 5th. Full participation by all members who can possibly attend (accompanied by friends who may have hidden interests in our Society) will help not only in better reorganisation of the Society but will also arouse greater dedication in your Council who, after all, do appreciate a helping hand.

Pomeroy Forestry School

By C. H. KERR, N.D.F. *

POMEROY House and Estate, extending to over 400 acres, was acquired by the Forestry Division of the Ministry of Agriculture in 1960 from Mrs. Alexander, widow of the late Major Alexander, M.C., who formerly resided there.

Pomeroy House is the original house of the Lowry family descended from the celebrated Lauries of Maxwelton in Scotland. It was built in 1765 by James Lowry, who at the time was Rector of Clougherney. However, in the main, the family had strong military and naval ties and was represented in all the 19th and 20th Century wars.

There is a strong tradition in the district that the stone for the building of the house was transported to the site by canal and traces of this are still visible.

The Forestry Division of the Ministry, since its inception in 1922, has acquired almost 130,000 acres of low value agricultural land for its afforestation programme. Like all other projects of a national character, forestry demands careful planning and there must be a definite target. This is to establish a minimum of 150,000 acres of productive forest as soon as possible. 75,000 acres of the acquired land have been planted to date and planting is proceeding at a peak figure of 5,000 acres per year. At June 1965 a labour force of almost 1,200 workers was employed.

Forestry is looked upon as a long term investment and it is considered important that all operations should be carried out efficiently to ensure a maximum return on the capital outlay. In recent years these operations have become more complicated, calling for the application of new methods and techniques. Since these operations depend to a very large extent on human labour, it was decided that an improvement in the skills of the labour force should be given a high priority. Therefore a training scheme, fitted to the Forestry Division's needs, was essential. Since forestry work is an outdoor occupation, training presents special difficulties. Unlike industry, where a labour force is concentrated within a limited space giving easy contact, forest labour is for the most part spread over the whole province and contact is therefore more difficult. This problem can be met either by having a regional training centre or by using a mobile instruction team. It was decided to adopt the first method, and because of this, Pomeroy House and Estate were acquired.

The location was central and two-thirds of the estate had been planted over the years with various tree species. Some of the arable land was found to be ideal for conversion into a Nursery where tree seeds could be sown and young trees transplanted. The House was

* Head Forester and Chief Instructor, Pomeroy Forestry School, Pomeroy, Co. Tyrone, Northern Ireland.

sufficiently large and had the facilities to accommodate a resident course of fifteen members.

The School was opened in October, 1961, and since then has been fully used. The principal object of the school is to provide workers and Junior Supervisors with a basic knowledge of silviculture and a practical training in the proper care and use of tools and machines, the latest forest operational techniques and the important aspect of labour relations. The school has also been used to provide Refresher Courses for Forest and District Forest Officers. Short Courses have been given to private estate Foresters, Landowners, School Teachers, The Society for the Protection of the Countryside, and the Town and Country Planning Institute.

In the present Annual Programme four types of courses are organised :—

1. *Forest Workers and Junior Supervisors.*

   About half of the year is spent on this type of course. It is voluntary and at no time is any worker compelled to attend. It is a three-week course with an interval of one month between each week's instruction. This is necessary because of domestic and other problems. Most workers are already well experienced and the aim is to marry this experience with the simple theory of forestry plus practical tuition.

   The importance of safe working methods is stressed, as forest workers are exposed to hazards which do not exist in other branches of industry. This safety depends on the skill, experience and alertness of the worker and he has to be helped to acquire these qualifications.

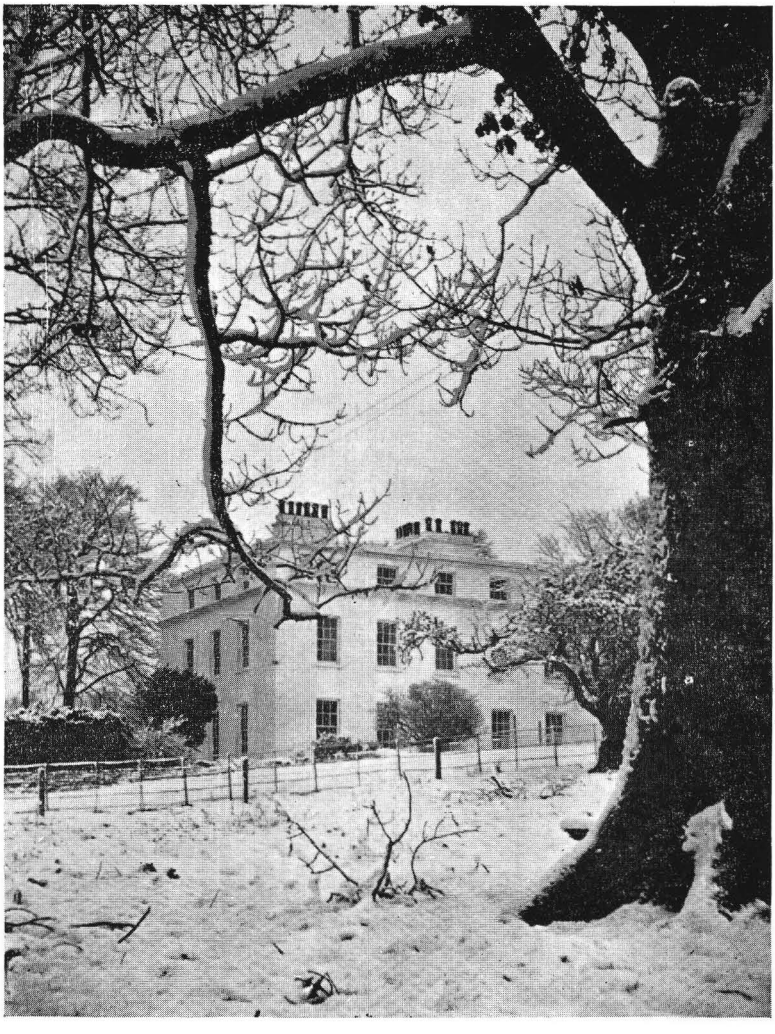
2. *Foresters and District Forest Officers.*

   This is a one-week course, so that this class of higher supervisor may be kept right up to date with current forest policy and techniques. Recent developments have highlighted the importance of intelligent supervision and much attention is given to ways of increasing the efficiency of this.

3. *Specialist Operators.*

   This is a one-week course for lorry and tractor drivers, mobile and chain saw operators. They are taught how to maintain their machines and to use them in as safe a manner as possible. Mechanisation in forestry is reaching a high standard of development and the importance of the economic employment of all forest equipment is stressed.

Since the School opened there have been eighty-six courses for more than five-hundred forest workers. Almost a hundred Foresters came to thirty-four courses and there were four special courses for District



Pomeroy Forestry School

Forest Officers. Two hundred specialist operators attended twenty-seven courses for different types of machine. Nineteen courses were organised for about two hundred people from various schools and societies.

Although it is difficult to make a material assessment of the benefits of the School over the past few years, there have already been signs of greater efficiency and lower costs, and an improvement in the quality of products. It has become evident that the social status of the forest worker has been raised, since he has shown standards of skill comparable with those in other more highly developed occupations.

The teaching staff, consisting of a Chief Instructor, Forester Instructor and a forest worker is assisted when necessary by specialist officers of the Forestry Division. Since all courses are resident, there is a domestic staff of four—three permanent and one temporary.

Pomeroy Forestry School is the first of its kind in the British Isles and it is expected that it will have a considerable and far-reaching influence on the outlook and efficiency of forestry in Northern Ireland.

American Forestry and Forest Management — An Introduction[1]

W. J. WRIGHT [2]

Summary

Some general aspects of American forestry are discussed. This is followed by a brief outline of forestry in the Pacific North West and the Lake States and some aspects of management in these two regions examined.

INTRODUCTION

The first essential step towards an understanding of American forestry is an adjustment to one's scale of thinking. There are 650 million acres of forest land in the United States and over half of this area is in private ownership. As one would expect in such a vast country, there is a very wide range of vegetation types — from sub-tropical swamps to sub-arctic tundra. In this short paper it is impossible to present a comprehensive picture of American forestry. Consequently, I intend to consider a few aspects of American forestry which may be of interest to the Irish Forester. In so doing it is hoped to provide a background for the two papers which follow.

GENERAL CONCEPTS

The National Forests

A few words now on the National system and its adminstration. There are 151 National forests totalling over 180 million acres and they are administered by the U.S. Forest Service, which is an agency of the Department of Agriculture. The National forest system was formed in relatively recent times, with the setting aside of the Yellowstone Park Timberland and Reserve in 1891.

These forests are now organised into 10 regions, with a Regional Forester as the administrative head. Next in rank is the Forest Supervisor, who is the manager of a National forest (average area 1 million acres). Each forest is sub-divided into Ranger Districts (equivalent to the "beats" in the Forestry Commission) each of which is staffed by a District Ranger, who is the "on the ground" manager in charge of all technical work. He can be considered as the equivalent of our Forester, except that the area under his charge is usually about 100,000-400,000 acres. All technical staff from the Chief of the Forest Service to the most junior District Ranger must have a college degree in forestry, or a related subject and there is no Forester grade in the Service as we understand the

1. Based on a paper read at a symposium on "Aspects of American forestry of Interest in Ireland" at Pomeroy Forestry School, Northern Ireland, on 22nd April, 1965.

2. Working Plans Officer, Forestry Division, Northern Ireland. W. K. Kellogg Foundation Fellow, 1961-1962, University of California, Berkeley, Calif., U.S.A.

term. All timber in the National forests is sold standing to private wood processing firms or contractors and in recent years the revenue from produce sold has been in the region of $100 million annually.

Multiple Use

One of the first and most important forestry concepts that the Irish Forester is likely to encounter in America is that of Multiple Use. The principle of Multiple Use is interwoven into the policy of the Forest Service and dominates the thinking of most American foresters. The multiple use of forest land has been applied in the United States for a number of years but was only given full recognition by Act of Congress in 1960. This Act directs that the five basic renewable resources of the National forest lands shall be utilised in the combination that will best serve the people of the United States. The renewable resources are named as Watershed, Timber, Range, Recreation and Wildlife. The emphasis is on positive management and utilisation of these resources rather than preservation.

When there is an abundance of natural resources and few people, there is little need for multiple land use but when an increasing population must rely on an unchanging or indeed diminishing resource base then the need to make the most effective use of these resources is self-evident. Thus multiple use helps to overcome the problem of scarcity. It tends to resolve conflicts of interest and competition for resources and promotes balanced resource use. An important point to remember, however, is that under this system of management it is seldom possible to get optimum production of any one resource, because of the concessions that have to be made to accommodate other resources. For example, in a forest managed for the production of timber, recreation and wildfire, one may have to forego the maximum production of timber in order that the other two uses can be accommodated.

Let us now look at the principle of multiple use in relation to our own Forestry Division. Until very recently it could be said that our forest lands were managed for the production of only one resource — namely timber. However, with the establishment of Tollymore Forest Park in 1955 and the appointment of a Wildlife Investigation Forester this year, we appear to be moving imperceptibly into multiple use management of our forest land. As the pressure of population on our resource base increases, then multiple use management is likely to become more widespread in our Division.

Recreation

The application of multiple use management is not without its problems and I would like to illustrate this with reference to recreation. The problem is that of how to determine the proper balance or combination between the five main types of value that forests can provide. This has been referred to by Dr. Vaux of the University

of California as "a national problem of primary importance . . . for determining the future trend of many forest based industries". In recent years, for an increasingly important part of the commercial forest area of the United States, the production of timber and recreation have come into sharp competition for the use of land. This situation is likely to intensify, as the demand for recreation is rising more rapidly than the demand for wood. In 1959 there were 81½ million recreation visits to the National Forests and a recent projection forecasts 230 million visits in 1975 and 600 million by the year 2000.

There is no convenient existing system whereby these two forms of land use alternatives can be balanced, as the normal laws of supply and demand to not operate. A further difficulty is that the various uses often have intangible values which are difficult to express in monetary terms. It is argued by some people that the traditional policy of free recreation on public lands is obsolete and that the problem could be alleviated by a reasonable system of charges on the recreationalist. Where recreation use is light, a policy of free recreation can be justified. In some areas in the United States, however, recreational facilities are inadequate to meet present levels of use and there is a danger that the recreational values themselves may be destroyed by over use. A system of charges would tend to reduce recreation demand and have a rationing effect and at the same time provide funds for additional developments rather than drawing on the general taxpayer. More important, however, this charge system would give the owners of private forests an economic incentive to develop recreational facilities on their land.

In our Forestry Division, recreation is virtually free although we do make nominal charges for car parking, camping and caravanning. This policy is justifiable at present but as the level of use increases, as indeed is the case at Tollymore Forest Park, it may be desirable to introduce a system of charges which would tend to divert recreationists to Mourne or Rostrevor forests or to a private estate. Charges for camping and caravanning are particularly important as nominal charges in Forest Parks would undoubtedly preclude the development of sites by private individuals.

Research

Without wanting to impinge on Mr. Gallagher's paper, I would like to stress the strong link between research and forest management in the United States. Wherever I travelled, I was conscious of the importance which the forest manager attached to research. This is shown in the research organisation of both the Forest Service and private industry. The Forest Service has nine fully equipped experiment stations which work in close co-operation with the Forest Regions mentioned earlier. The recently established Forest Research Centre of the Weyerhouser Corporation at Centralia, Washington,

is indicative of the importance which private industry attaches to research. This research centre is staffed by 17 highly qualified workers under the direction of Dr. G. S. Allen, who formerly held the chair of Forestry at the University of British Columbia. Dr. Allen in a recent report of the work of his centre sums up the whole attitude to research in America as follows:

> "These are no ivory tower people delving into the unknown for sheer excitement but down to earth trouble shooters working largely in the forest in close co-operation with the tree-farm field-staffs. Their job is to recognise problems, find solutions and tailor the latter for practical application. The objective is to point the way to practices that will enable the Weyerhouser Company to grow better forests more economically".

In this country research is still regarded as something of a luxury rather than an essential investment to provide a sound foundation for management decisions. In our Forestry Division our research organisation consists of one Forest Officer (part time only on research) and one Forester who is mainly engaged on field work. In addition, some research work is done in co-operation with other Government Departments. One wonders, however, if our present research organisation is adequate to serve an industry with an investment to date of around £12 million.

THE PACIFIC NORTH-WEST REGION

Introduction

Virtually all the remaining old growth timber in the United States is in this region. There are 121 million acres of commercial forest land, which represents 25% of the nation's total commercial forest land but they carry 70% of the nation's saw timber volume. The development of forest industries has contributed in a major way to the expanding economy of the western states and is in some areas the mainstay of the economy. In Oregon for example, 20% of the total labour force is directly employed in the harvesting and processing of forest products, with many more being employed in servicing and facilitating this primary industry.

Prior to the end of the last war forestry in this area was mainly a matter of logging old growth timber and forest management or the principle of sustention were virtually unknown. Since then, and more particularly in the last ten years, more attention has been focussed on sustained yield management.

Reforestation

Traditionally areas of old growth timber were logged and little thought given to regeneration. This often resulted in more valuable species like Douglas-fir being replaced by western hemlock, re-generating from stool shoots, or the more valuable sites being colonised by alder. However, with the increase in stumpage values

during the last 15-20 years, more thought has been given to regeneration and to date over 1½ million acres have been planted. Current practice in the Douglas-fir region is to plant about 600 trees per acre immediately after logging but this is often supplemented by natural regeneration. As there is no ground preparation, establishment costs are low, averaging about $30 per acre. However, the investment of capital in reforestation is viewed cautiously in relation to potential trends in future demand and supply of forest products.

One of the methods of reducing reforestation or afforestation costs is to increase the planting spacing and in this connection I visited an interesting Douglas-fir spacing experiment at the Wind River Experimental Forest in southern Washington. The experiment was established in 1928 to test spacings ranging from 4 ft. × 4 ft. to 12 ft. × 12 ft. As one would expect average diameter increased with the wider spacing and the trees in the 12 ft × 12 ft. spacing had notably larger branches. The top height also increased in the plots with wider spacings but I suspect that this may be due to site differences. The advantages of wider spacing quoted were that trees reached a merchantable size earlier and the volume of small sized material (unmerchantable in this area) which is normally removed in early thinnings is minimised.

In our Forestry Division some thought has recently been given to the question of increasing our planting distance from the traditional 5 ft. × 5 ft. Indeed, replanting at Baronscourt Forest has been done at 10 ft. × 5 ft. and at Lough Braden Forest planting on blanket bog is at 7 ft. × 7 ft. The reduction in establishment costs coupled with growth being added to fewer stems are important advantages of wider spacing especially in areas where stands are being grown for the production of smallwood material with no thinning. In areas being managed for the production of saw timber wider spacing would also tend to eliminate the unproductive early thinnings, although pruning of final crop stems would be essential for quality saw timber. It is, therefore, felt that there is a strong case for an overall policy of wider spacing up to 10 ft. × 5 ft. or 7ft. × 7 ft. (870 trees per acre) but that more research work is required before wider spacings than this can be justified. An important aspect of this research work should be a comparison of the costs of ground preparation, planting, weeding, beating up, brashing, pruning, etc., for each of the different spacings on trial.

Thinning

Thinning is probably the major silvicultural practice characterising intensive forestry. In the Pacific North-west region thinning is a relatively recent concept and only a very small acreage has been treated to date. It is estimated, however, that there are about 5 million acres which are suitable for thinning in the Douglas-fir

region alone. The main reason why thinning has not been practised in the past is that it was uneconomic — in other words the costs of logging operations exceeded the price offered for the produce obtained. Commercial thinning, however, is bound to become increasingly more important as the old growth forest is depleted and as markets and methods of utilisation improve.

As the recent trend in our Division is towards no thinning in certain circumstances, it may be of interest to look at some of the considerations which have influenced the thinking of foresters in the Pacific North-west.

The first basic principle is that thinning should only be undertaken when it will yield a direct economic return — a commercial thinning, so called. It is recognised that a pre-commercial thinning may be worthwhile in that the value of the future crop may be ultimately increased. This, however, is often difficult to appraise and is not generally accepted.

Secondly, it is recognised that regular thinnings can channel the growth potential of the site on to a few of the best and most vigorous trees — in unthinned stands the increment is spread on all the living trees in the stand. Therefore, at the end of the rotation stands which have been thinned regularly are made up of a few high quality stems which demand a high stumpage value because of the higher value of the produce per cubic foot and the cheaper logging costs of large material.

Thirdly, thinning is important in the harvesting of mortality, resulting from suppression or occasionally from disease or windthrow. With the short rotation in Ireland the salvage of suppressed trees may not be important as these trees will be small but when stands are left unthinned for 100-150 years as in the Pacific North-West, mortality is an important consideration. For instance, it has been estimated that with Douglas-fir grown on a high quality site, on a rotation of 100 years, regular thinnings would increase the International board foot yield by 24 per cent. Under our conditions the salvage of windthrow in unthinned stands may be a more important consideration.

Fourthly, thinning has an important role in the genetic improvement of stands which are being regenerated naturally. Thinning removes all trees of poor phenotype and develops the seed bearing potential of the final crop trees.

Finally, two less important objectives of thinning are to reduce the fire hazard and the prevention of fungal and insect attack.

Undoubtedly, there are many important advantages in thinning stands but these all hinge on the operation yielding an economic return. I, therefore, submit that, in our Forestry Division, unprofitable thinning should be discontinued. On the other hand, it is imperative

that our logging techniques should be investigated and improved so that the costs of thinning may be reduced.

Contorta Pine

Before leaving the Pacific North-West a short comment on contorta pine would not be out of place. During my study tour in this region I was particularly interested in finding out as much as possible about this species. It has a remarkably wide geographic range from lower California to Alaska, and from the Pacific coast inland to the Blck Hills of South Dakota. There is a great range of variation within the species and it shows a markedly differing reaction to different sites. This, together with the possibility of hybridisation with other species of pine would seem to offer great possibilities to the geneticists to produce a suitable tree for use in this country.Natural hybrids of lodgepole pine with Jack pine (*Pinus banksiana* Lamb) are found in Alberta, Canada, and in both the Pacific North-West and the Lake States geneticists have been crossing these two species by controlled pollination. It is hoped to produce a hybrid with the vigour of the lodgepole parent and the superior form of bole of the Jack pine. To my knowledge the Forestry Commission have not yet done much work on contorta pine and this hybridisation would appear to be a rewarding avenue for further research. In general I was impressed by the prominence given to genetics in forest research in Aemrica. This is looked on as a good investment as geneticists feel that in time they can do as much for quality timber production as they have now achieved in cereals.

In this Forestry Division little or no attention has been given to genetics and, indeed, even our seed orchards scheme has been unsatisfactory. Is more research not required?

THE LAKE STATES REGION

Introduction

This region comprises the states of Minnesota, Wisconsin and Michigan. The forests of the Lakke States were virtually unexploited until the beginning of the nineteenth century. The opening of the Erie canal in the early 1800's gave impetus to westward migration and as the new settlers arrived forests were cleared to provide farmland and for lumber. Furthermore, as the eastern forests were depleted of white pine (*Pinus strobus* Linn.), the large lumber companies turned to the Lake States. Throughout the remainder of the nineteenth century and until the end of the first world war, this region was ruthlessly logged and was the main lumber producing area in the United States.This was pure exploitation of the forest resource and no thought was given to the future regeneration of the forests. Extensive fires were common, the most famous being the Peshtigo fire in 1871, which was the most calamitous in American history. It burned over 1,280,000 acres in the state of Wisconsin, homes,

towns and settlements being swept away and 1,500 people lost their lives. Land which had been logged and burned was mainly colonised by aspen/birch in mixtures and less commonly by Jack pine. The aspen/birch forests, which are now pole sized were at first regarded as weeds but now form the basic resource of the large pulpwood economy of the Lake States region.

In all, there are over 68 million acres of forest land in the three states of Minnesota, Wisconsin and Michigan. Most of the stands are of pole size and management is more intensive than in the Pacific North-west. Only a few small remnants of the original virgin forest have been preserved. Most of the production is pulpwood and the small proportion of sawlogs produced are not of the highest quality. Sawlogs are processed in numerous small sawmills which are quite unlike the large-scale, highly mechanised mills of the Pacific North-West region.

Black Spruce (*Picea mariana Britt St and Pogg*)

While in the Lake States, I spent a large proportion of the time in studying the management of Black spruce which occurs extensively on the peat swamps of Minnesota. It is found in almost pure stands on about $1\frac{1}{2}$ million acres of productive swampland in the north of this State. It also occurs in mixture with Jack pine, balsam fir, aspen and birch on the upland soils. It is an important pulpwood species, as even mature stands are only of pole size and the wood is white, non-resinous and has long fibres. Another interesting use of this species is for Christmas trees and about $2\frac{1}{2}$ million are cut annually. They are cut primarily from the tops of 10-20 ft. trees on sites that are too poor to produce pulpwood. Does this not suggest a market for stands of checked Sitka spruce ! ?

Black spruce is a rather slow growing species, typical stands being no more than about 50 ft. in height and 9 ins. diameter at Breast Height at 100 years. The Forestry Commission Yield Tables (1953) indicate a Top Height of 70 ft. for Quality Class V Sitka spruce at 50 years. Management is therefore very extensive and any capital investment is kept to a minimum. Stands are generally left unthinned— final felling and regeneration being carried out at 100-150 years depending on the quality of the site. I had hoped to learn of new extraction techniques for use on wet bogs but discovered that extraction in these swamps is no problem as it is done in the winter months when the ground is frozen to a depth of about 3 feet. As I visited the area in July I was unable to see any logging operations. In recent years more attention has been given to the natural regeneration of black spruce and I want now to deal with this in more detail.

Regeneration of Black Spruce

The regeneration area that I visited was located on peat 2-5 ft. in depth which had been formed over the silts and clays of a former glacial lake. The surface peat was raw and acid (pH 3.5-4.5) but decomposition and pH increased with depth. The ground vegetation under the spruce stands was remarkably comparable to similar habitats in this country. Typical species of moss noted were *Hypnum schreberi, Hylocomium splendens, Polytrichum* sp. and on the poorer sites various species of *Sphagnum.* On some sites various species of *Carex* and *Vaccinium* were also present. The stands were of pure black spruce, more or less even aged, with a mean height of 50-70 ft. and previously unmanaged.

Various cutting methods were applied in order to assess the best method of regenerating these stands by natural means. The main treatment were as follows :—

1. Clear felling narrow strips.
2. Clear felling in small patches.
3. Shelterwood system.
4. Group selection system.

This study was initiated in 1948 and results to date indicate that the two clear felling methods are the most effective in regenerating stands of this type. The strips were cut about 1 chain wide and 6-10 chains long, oriented north-south and separated by 4-5 chains of standing timber. Clear cut patches were $\frac{1}{4}$-$\frac{1}{2}$ acre in size. In both cases the initial cut removed about 1/5 of the total area of the stand. The shelterwood system was also effective in providing good regeneration but the risk of the shelterwood trees being windthrown is high. The group selection system was not promising because reproduction cannot make satisfactory growth in the heavy shade associated with small openings.

The nature of the ground covering has an important influence on the germination and development of seedlings. In this study feather mosses, raw litter tnd slash were poor seedbeds whereas germination was good on disturbed peat, burned duff and on *Sphagnum.* The area occupied by *Sphagnum* increases after cutting due probably to increases in light and soil moisture. Although seedlings germinate well in clumps of *Sphagnum* they are often engulfed and killed where the *Sphagnum* is growing fast. The normal practice is to burn slash after felling thus increasing the seedbed area, as about 10 years are required for it to disappear naturally.

In the regeneration of these stands it was stressed that the cost of regeneration must always be related to the quality of the site. From an analysis of costs and expected returns it had been calculated that on the poorer sites investment is unprofitable at discount

rates above 2%, whereas, on the better sites regeneration costs of 50 dollars per acre yielded a 2% return even allowing for high land values. This would suggest that on the infertile blanket bogs currently being planted in our Division we should adopt an extensive management regime with investment per acre kept to a minimum.

In our Forestry Division only a very small area has been clear felled, with the exception of clearing fairly extensive windthrow. Cleared areas have been re-afforested by planting. Little thought has yet been given to methods of felling and the regeneration of our future crops. It will be, perhaps, thirty years before many of our stands reach rotation age, but I feel that now is the time to anticipate future problems and attempt to solve them. Has natural regeneration any place in our forestry practice — what felling methods will minimise the risk of windthrow and erosion ? These are important problems which can only be solved by long term research.

Windthrow is prevalent in black spruce areas. Recent studies of this problem have yielded two interesting trends. Firstly, that stands of black spruce are less susceptible to windthrow on peats over 2 ft. deep than on upland soil or shallow peat. Secondly, that the risk of windthrow is greater in stands that have been thinned than in uncut stands. This perhaps lends some assurance to our decision to adopt a no thinning regime in some of our deep peat areas.

The Philosophy of American Forestry Education [1]

By W. G. DALLAS[2]

INTRODUCTION

An alternative title for this paper could be "The Profession of Forestry and the Education of Foresters and the Public—what can we learn from the Americans?" The paper is the end product of almost five years reflection on an academic year spent at an American University, followed by three monthhs travelling in the United States of America, meeting foresters, forestry educators and researchers, forest industrialists, loggers and the American people. Since it is a reflection, coming after almost five years of thought, rather than a spur of the moment exercise, following impression or disappointment, it should be more objective in approach.

THE FOREST — DEFINITION OF

To understand fully the differing concepts of Forestry in America and Britain we must start by defining the word "Forest". An American definition states thus :—

> "A Geographic entity which includes all the components of the area — both organic and inorganic and in which trees are the dominant form of vegetation". (Webster)

An Oxford Dictionary defines the word :—

> "Large tract covered with trees and undergrowth sometimes mixed with pasture, with trees growing in it or unenclosed woodland district kept for hunting, usually owned by the Sovereign".

We see therefore, at the outset, a basic difference in approach. We tend to think of forests as consisting only of trees. The decreasing popularity of hunting, for economic reasons, and the changing nature of the forest due to the introduction of exotic conifers has, through the ages, resulted in this tendency towards "mono-interpretation".

The first paper has most clearly shown the immensity of the forests of the United States. We have heard that 34% of the land areas of the 48 contiguous states and coastal Alaska is Forest Land. The skilful management of this vast area, then, is the target of the United States forest educator and this management is called forestry. In the next stage in the build up process I wish to again define, this time, the almost every day word — "Forestry".

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1. Text of a paper read at a symposium on "Aspects of American Forestry of Interest in Ireland" at Pomery Forest School, Northern Ireland, April 22nd, 1965.

2. District Officer, Forestry Division, Ministry of Agriculture, Northern Ireland. W. K. Kellogg Foundation Fellow, 1959-1960, Orgeon State University, Covallis, U.S.A.

"FORESTRY" — DEFINITION OF

To our relatively unenlightened public "forestry" in many cases still simply means "cutting down trees". I find also that, to many of our foresters, forestry is essentially the management of forest lands for the production and utilisation of timber. In contrast, the American concept of forestry is well illustrated by Graves and Guise (1932) in their book "Forest Education" :—

> "Forestry is first of all concerned with the constructive management of forest land . . . Timber is not the only resource with which the forest has to deal; the science is concerned with various other resources that are an integral part of the forest. In many forests, grass and other forage plants may be used for the grazing of livestock without jeopardising the forest growth. Here and there, areas of cultivable land may be farmed without interfering with forest management. The protection and management of wild life in the forest and of fish in the streams and lakes and the use of the forest for recreation, fall naturally within the task of the forester. Likewise, mining of materials, the development of waters for irrigation, power, and domestic use, and the use of lands required for special purposes by local industries must be co-ordinated with forestry in order to obtain the maximum service of many large properties".

Graves and Guise go on to say :—

> "In managing timber resources, the task of forestry does not stop with the growing of trees and their replacement after cutting. It includes also the economical and efficient use of wood products. The manufacture, distribution, and use of wood products are intimately related to the growing of raw materials. This statement does not mean that logging, lumber manufacture, and merchandising of forest products, taken by themselves, constitute forestry. These activities become an important feature of the forestry enterprise only when they are correlated with and contribute to the conservation of the forests on which their permanence depends. Coversely, silviculture can be carried on successfully only when correlated with industrial and economic requirements."

These quotations should clearly make the point that forestry is much, much more complex than popularly believed. The final sentance of the second quotation deserves particular notice and gives scope for much searching thought.

At this point the basic objective of United States forestry is also worth noting. This was expressed by Secretary of Agriculture, James Wilson in 1905 in a famous letter of instructions, concerning the administration of the national forests, to the Chief of the United States Forest Service. The purpose is, he stated, to assure "the greatest good of the greatest number in the long run."

Dana and Johnston (1963), commenting on this, stress that

> "To achieve this goal there must be a net income; receipts must exceed costs. But both receipts and costs may be tangible or intangible, economic or social. They may or may not be measurable in dollars".

This provides yet another facet to dwell upon. Now with, I hope,

a slightly wider concept of Forest and Forestry in mind let us move a step further and look at the Forester.

THE FORESTER — DEFINITION

Obviously in defining Forestry the Forester has to some extent been defined too. However, it is interesting to consider an American interpretation.

One definition is "A Forester is basically a practitioner—a manager or administrator whose unique professional competence lies in his ability to utilise the Sciences (biological, physical and social) and the humanities[1] in the planned management of specific tracts of land for the attainment of specific objectives".

This admittedly is not how the American public sees it's foresters, but the interpretation within the profession. Without pausing to consider how the Irish public sees it's foresters, we should reflect for a moment how the profession in Ireland would define the same word. I feel that while a minority may see it from the American point of view, many would have to define him as an essentially practical individual to whom the sciences are mere series of "ologies".

If our own definition does not measure up to the American one then we must ask ourselves—Has our management of our Natural Resources suffered as a result ?

My impression is :— not very much to-date; but with the immediate necessity of paying more attention to the fields of recreation and wildlife, also with the acquisition of more and more water catchment areas, I feel that we must orientate our thinking more in the direction of a multiple use basis of management.

THE PROFESSION OF FORESTRY

I now want to further consider forestry as a profession and the first question that may be asked is—What is it's scope ? Dana and Johnston (1963) define it's scope as

> ". . . much broader, the values with which it deals are much greater and more diversified and the skilful management of forest resources is more difficult than is realised by the general public or perhaps even by many foresters".

They go on to say

> "Forestry requires professional men, technicians, skilled workers and unskilled workers—BUT the key figure is the professional forester".

United States foresters are extremely proud of the academic and

1. A definition of the sometimes mysterious American term "humanities" is the following collection of subjects:—
English composition, literature and speech, fine arts, music, foreign language, philosophy, religion and other restricted electives. On the other hand, Social studies are defined as economics, political science, history, geography, psychology, and restricted electives.

social standing of their profession and throughout their country it ranks with the greatest professions and is greater than many. I wonder how many professional foresters in Ireland look on forestry as a true profession. How many of us have even considered just what a profession is ? Numerous people have defined the term but perhaps Tawney (1920) does it best. We should note the emphasis that service is an essential attribute :—

> "A profession may be defined most simply as a trade which is organised, incompletely, no doubt, but genuinely, for the performance of functions. It is not simply a collection of individuals who get a living for themselves by the same kind of work. Nor is it merely a group which is organised exclusively for the economic protection of it's members, though that is normally among it's purposes. *It is a body of men who carry on their work in accordance with rules designed to enforce certain standards both for the better protection of its members and for the better service of the public.* The essence of (a profession) is that, though men enter it for the sake of a livelihood, the measure of their success is the service which they perform, not the gains which they amass".

The italicised portion of this quote is worth noting, particularly the words "in accordance with rules designed to enforce certain standards". The maintenance of, and adherence to, a code of professional ethics throughout the forestry profession in the United States impressed me greatly. This ethical code was adopted in 1948 following long years of battle to achieve it. It was controlled by that great body— the Society of American Foresters — who also controlled forestry education, and it's title is "Guiding Principles of Professional conduct for a Forester in his relations with other Foresters, with his Employers and with the Public". Great emphasis is also placed on the maintenance of high ethical conduct in the field of forestry education.

The Graduate versus the Non-Graduate

The same segregation of grades within the profession that is common to Britain and Ireland exists in the United States. However, it is rigorously enforced there. The American "Forester" is similar to our Forest Officer grade except that he *must* be a graduate. The Society of American Foresters defines "Forester" as :—

> "a person who has been professionally educated in forestry, or who possesses qualifications for the practice of forestry essentially equivalent to graduation from a recognised school of forestry".

and the terminology "school of forestry" implies university rather than vocational training. Canadians prefer, for this same grade, the term "professional forester"— meaning one formally licensed[1] to practice forestry.

In the United States, our foresters are categorised as technicians, which is an appropriate enough term. They are, however, often referred to as sub-professional or semi-professional. These two terms annoyed

1. Licencing will be dealt with in a subsequent section.

me greatly and still do, in that there is little really sub- or semi- in our foresters.

Great controversy exists in these Islands about the necessity for such a rigorous break down into grades. Many say "lump them all together and if the graduate is as good as he is supposed to be he will come out on top". This may be fine, but where will it eventually lead forestry ? There must be segregation, I feel, and Dana and Johnston (1963) make a good case for it :—

> "Most professions require the participation of others than those who give them their distinctive character. Physicians, for example, do not personally handle all the work in a hosipital, or even in their own offices. Engineers do not build roads, or manufacture machines, or construct resevoirs with their own hands. Professional foresters do not themselves perform all the tasks involved in the management of forest lands. They prepare and supervise the execution of management plans, but they have the help of other professional men, of scientists, of technicians, of skilled and unskilled workers, and of stenographers and clerks.
>
> Among these latter groups, the one in which this study is particularly interested is that composed of the technicians, the men who handle or direct the techniques of applying management plans on the ground and who serve as the liaison between the professional and forester and the skilled or unskilled worker. They are commonly, but less appropriately, known as sub-professional or semi-professional workers. In engineering, it is commonly estimated that one professional engineer, on the average can advantageously use the services of ten technicians ; and a similar or somewhat smaller ratio might apply in forestry".

George S. Allen[1] here probably gives one of the best breaks down into classification that can be obtained. He states :—

> "The distinction between professional and technical men seems to be fairly clear: the professional is expected to be broadly knowledgeable in the many subjects that make up Forestry Science and Art, and should be capable of planning, analysis, and exercising overall supervision, usually on an ever-broadening front as he progresses from junior to more senior positions. The technician or equivalent is trained in one or a few specialities with only enough fundamentals to give him a reasonable understanding of the work involved. He is expected to carry out the plans or directions of the professional within specified areas. The tendency seems to be to broaden the technical man's training, and hence to reduce specialisation, in order that he may be able to perform adequately on a variety of jobs and fit into the season-to-season or year-to-year programmes of his employer with a minimum of 'on the job' training".

To define further the necessity to categorise foresters by training would be to labour the point. I feel, however, that the whole profession of forestry can only be uplifted into its proper place in our community if a similar segregation can be effected. Let us then emulate forestry in the New World and have a profession of university trained foresters and a separate cadre of forest technicians. These technicians

1. Former Dean of Forestry, University of British Columbia, now Director, Weyerhauser Research Centre, Centralia, Wash.

would be as élite a cadre as their professional colleagues and do a job as essentially important, in the framework of forestry, as do these colleagues. A harmony of these two divisions, not under one professional mantle but between two fully competent sections of it, should be our ultimate goal. Many are the errors that have been made by graduates undertaking tasks that should have been allotted to properly trained technicians, and many a fine technician has been lost when promoted to fulfill tasks necessitating the broader basic training of the graduate.

Much must be done in Ireland before forestry is accepted socially and academically on a par with other professions and as it is in the United States. A possible reason for it's "stratification of acceptability" here is the traditional acceptance of forestry as a craft, governed by certain rules of thumb and a mystic awe for Mother Nature, rather than a science. The Forester, in turn, may be seen as a truly earthy individual with gnarled and often dirty hands, rather than a scientific manager of some of the nation's most important natural resources. Do we ever ask ourselves, I wonder, why foresters are not accorded the same social status as other professions, many of which demand less rigorous standards of training and education ?

Let me confirm that the division I speak of, between the professional forester and the technician is very real in America. There are, however, relatively fewer technicians than professional foresters. This is, of course, the reverse in this country and Dana and Johnston (1963) as a matter of interest, give the following reason for this. They state that it :—

> "is due to the fact that in the early days, professional schools of Forestry were organised primarily for the purposes of preparing men to assume leadership in introducing the practice of forestry. Intensive forest practice was impracticable and the custodial and protective activities that constituted so large a part of Forest Management could be handled by practical men whose training had been the school of experience".

The present status of the forester in the United States was, however, not achieved without a fight. Listen well to H. H. Chapman speaking with specific reference to the Society of American Foresters (Chapman 1934) :—

> "We can no longer postpone the decision as to whether this Organisation is, in fact, a professional society or a mere loose aggregation of practising or non-practising foresters and woodsmen—The standards set up by the professions of Medicine, Law and others demand a basic theoretical education as the undeviating requirements first for admission to the Professional Societies, and second for a licence to practise as a member of this profession. To continue the present muddled policy on memberships is simply to admit that Forestry has not yet been recognised by it's own members as a profession in distinction from a craft—Either we are a profession or we are not".

This actual quotation was made during the fight for accreditation

of American Forestry schools and will be referred to again later in the paper.

In conclusion of this section let us look at the professional forester in summary. "Forest Education To-day and To-morrow" (Dana and Johnston 1963) summarises his characteristics thus :—

"1. He is well grounded in the basic biological, physical, and social sciences.
2. He has a thorough grasp of the principles and practices involved in the application of basic knowledge in the science, art, and business of forest land management.
3. So far as existing knowledge permits, he understands not only how things happen but WHY they happen as they do in both the virgin and the managed forest ; he understands the relation between causes and effects.
4. He is equipped to formulate forest policies, to prepare plans for the integrated management of the forest's various resources that give full consideration to biological, physical, economic, and social factors, and to supervise the execution of these plans.
5. He has a comprehension of people and of human institutions that makes him at home as an individual, a citizen, and a professional man in the community in which he lives and works.
6. He recognises that the objective of his activities is the rendering of useful service, which may take a wide variety of forms.
7. He is guided in all his activities by his profession's code of ethics.
8. He joins with his fellow foresters in advancing the interests and maintaining the standards of the profession".

The task of the schools of forestry is to educate men possessing these characteristics.

Let us ask ourselves, this minute—how do we measure up ?

Having built up the background of the forestry individual we will now go on to build up a brief background to the present forestry education system — first of all in United States Universities then in the Technician or Ranger Schools. We will afterwards look very briefly at the curricula of each.

HISTORY OF EDUCATION IN THE UNITED STATES.

Prior to 1897 when a forestry policy for Government timber lands was established, the history of forestry in the United States was one of almost reckless exploitation. The history of the exploitation was also the history of the colonisation and the onward creep of civilisation. Many bills were drafted prior to 1897 designed to stem the tide of this destruction, but like most bills they had loopholes and were largely ineffective or not wide enough. Great names later to figure in the further development of forestry like B. E. Fernow, Theodore Roosevelt and Gifford Pinchot were among the leaders of this fight.

Forestry education really commenced in the United States in 1898, when two schools of forestry opened, the New York State College of Forestry at Cornell University and the Biltmore Forestry School on the Vanderbilt Estate near Asheville, North Carolina. Both were headed by men who had been trained in Forestry in Germany, B. E. Fernow at Cornell and C. A. Schenck at Biltmore.

Next came Yale University in 1900 under Henry S. Graves—a Yale Graduate who later studied forestry in France and Germany. The number of forestry schools multiplied rapidly until the Great War and then resumed afterwards.

Accreditation

As the number of schools increased many people wondered if the increase was not too fast and felt that perhaps their curricula and courses were being relatively uncontrolled. A request for a rating of Forestry Schools was then made. This rating would measure by degree how the schools fulfilled the requirements of professional training. The idea however, was rejected by two great workers in the field of Forest Education who maintained that Forestry had not yet stabilised like Medicine, Law and Engineering and that there was not a full recognition of it's requirements and standards of forest education.

However, a system of stabiliation in the form of accreditation eventually came in 1949 with announcement of the minimum subject matter requirements.

Accreditation is in the sole hands of the Society of American Foresters and today there are 28 accredited universities and eight unaccredited universities in the United States. Unaccredited universities of course, endavour, by control of Faculty and courses, to achieve accredited standard.

Registration and Licensing

Almost side by side with the fight for accreditation was the demand for the registration or licensing of practitioners which in the United States is a State requirement of long standing in many professions. Professor Chapman, one of the champions of this cause stated around 1938 that:—

> "Legal recognition and protection are the objectives of all professions" but that "Foresters so far have not attained this recognition in the eyes of the law and are still on the status of common untrained labourers or vocational foremen".

The Society of American Foresters led the promotion of legislation for registration and licensing and in 1951 the State of Georgia provided for the registration of qualified foresters and prohibited all others from using the term "Registered Forester". Four other States have since followed this example, Michigan, Alabama, Florida and South Carolina. Georgia has since made registration mandatory.

Dana and Johnston comment on licensing as follows :—

> "Licensing and education can be mutually beneficial. State legislation usually requires that a candidate for licensing or registration must be a graduate of an approved school of Forestry or must have acquired by experience a knowledge of Forestry equivalent to that represented by such education. In practice, this leaves the Board of Registration free to approve only schools that are accredited by the Society of American Foresters. This is a policy that puts strong pressure on unaccredited schools to strengthen their programmes.
>
> At the same time the strengthening of educational programmes at all Schools of Forestry, stimulated by stricter standards of accreditation will automatically assure greater competence on the part of candidates for licensing. The schools and the Society of American Foresters, working together, can do much to make licensing more effective by putting professional education on an increasingly higher plane".

In these Islands the first steps in regulating the forestry profession have been taken by the Society of Foresters of Great Britain with their registration of forestry consultants. Wider terms of reference enabling this body to keep a watching eye on education and the supply and demand of graduates would, I feel, be beneficial also. In Ireland, with only two schools of Forestry, the task of regulation is much easier. The Society of Irish Foresters can certainly play a large part in maintaining and improving the standards of training, education, and the profession in general.

Now for the technician. It is generally thought that there are few technician schools in the United States. Certainly there are many fewer than professional schools but they also are on the increase. The Biltmore School—already mentioned was the first, although it did not rank fully as a Ranger School. The first Ranger School proper was established by the University of Southern California in 1899. Other schools followed at Colorado A and M college and North Dakota School of Forestry. The story continued from here, schools came and schools closed. As more schools open the controversy between the technician and the professional forester continues. Arguments may be heard in favour of the necessity for more technicians and other arguments may also be heard for the use of the professionally trained forester in jobs which could possibly be carried out by technicians. As Dana and Johnston (1963) say :—

> "the long term prospect is, however, unclear. The probability is that technicians and the formal training of technicians will play a more prominent part in the forestry enterprise in the future than in the past".

BASIC FORESTRY TRAINING

(a) The Technician

I now wish to consider forestry education, having developed it's background. First of all, — technician training. One of the forestry schools I visited was the New York State, Ranger School at Wanakena.

This school is a Division of the State University College of Forestry at Syracuse University. This fact is in itself interesting—that of having a technician training school attached to, and part of, a University. This is quite a common procedure and not by any means peculiar to the New York State School. The school trains men for foremanship and those who qualify are eligible for positions of responsibility between those of the average woodsman and the professional forester. The course is terminal in nature — which means that it is not designed for students interested in a professional degree in forestry. Subjects necessary for entrance qualification are plane geometry, elementary algebra and mathematics. The course is eleven months long and is in session for all this time except for a few short recesses. Approximately 50% of a student's time is spent in class-room and discussion. Formal classes are held for 5½ days each week. The student's day commences at 6.15 a.m. and classes at 8 a.m. Each evening, students are expected to work on assignments from 7.30 p.m. There are no free periods or elective courses and students are encouraged to devote their free time to enjoying the recreational advantages provided in the woods through such sports as camping, fishing, snow-shoeing and in developing, through these activities, a familiarity with forest environment. Athletic activities are not emphasised and there are no organised sports as part of the programme. Students are not permitted to have motor cars as they are expected to devote their full efforts to accomplishing their purpose in attending the school. Subjecs are pretty well the same as at our own Forestry Schools.

Where does the moral of this story lie ? Having seen this school in action and met both staff and students, I am fully convinced that fine foresters can be produced in *one* year thus saving taxpayers money and the students' time.

(b) The Professional Forester

Dana and Johnston (1963) quote one of the primary functions of a school of forestry as "the education of men of high professional calibre". They state :—

> "High professional calibre includes not only technical competence as a practitioner but the broader development which is the mark of the truly educated man. It connotes a combined scientific and liberal education that provides the abilities and the skills to work with nature and with man in identifying and solving complex problems".

Keeping this at the back of our minds let me first of all confirm that the basic courses are pretty well the same as those in Britain and Ireland. A foundation of the basic sciences is required before the applied courses are commenced. Certain "core" subjects are insisted upon for the applied course, and these are basically similar to those at present on the curricula of British and Irish Universities. The subjects are Dendrology, Forest Ecology, Silviculture, Forest Protection,

Forest Measurements, Forest Economics, Forest Policy, Forest Administration and Forest Management.

I will now comment on these where differences with our conceptions of them exist. For want of a more concise and explicit description of these subjects, I have again gone to "Forestry Education Today and To-morrow" and admit to downright plagiarism in several places. In the interests of brevity and clarity I therefore do not apologise for this.

Dednrology: This is an American term for subject material common to British curricula—it teaches the characteristics, distribution and the occurrence of the major tree families and forest types.

Forest Ecology: This subject is greatly stressed in American Universities. It teaches the structure and operation of the forest community including the plant and animal ecology and the silvical characteristics of forest trees. Inter-relations between organisms and their physical environment, including "forest influences" is stressed.

Silviculture: This subject is pretty well as we know it, except that it is stressed that silviculture should be taught as an art which is based primarily on the biological sciences—notably forest ecology and plant physiology. Silviculture is also related closely with the subjects of protection, mensuration, economics and management. My personal experience of this subject in the graduate school was mainly physiological and it greatly influenced my philosophy of silviculture. I now feel that a most thorough grounding in plant and Forest Tree Physiology is necessary before a course in silviculture is fully appreciated. In fact, I feet that Forest Tree Physiology is the foundation on which all forestry stands or falls. We should and must have more of it taught.

Forest Protection and Forest Measurements: These subjects are very similar to our conceptions of them except that fire protection gets more than lip service and that photogrammetry is considered an integral part of mensuration.

Forest Economics: Again pretty well as taught in this country, the object being to clarify and illustrate the practical use in forest management of the conomic principles and facts that play such an important part in determining the policies and the practises of both private and public owners.

Forest Policy: This subject is not taught with exclusive reference to the United States but more with a world wide cover. It is a subject that deserves much more attention in our curricula than it receives at present. The breadth of view needed by foresters for exerting leadership both within the profession and in the development of

sound policies relating to forestry requires a knowledge of the history of the profession with special reference to the policy problems that it has faced and will continue to face. An understanding of the motivations, influences and processes that shape both public and private policies—of which and how policies develop in a democratic society—is of particular relevance in a profession with such strong economic and special impacts as forestry.

Forest Administration: This subject teaches the principles of administration including organisation of personnel and finance with special reference to the problems faced by both public and private agencies at different levels of administration. This is another subject which is not generally required but with which a forester comes into such frequent contact that ability to deal with the problems it presents is essential. Its importance increases as he rises to higher levels of responsibility. It is also a subject that is not covered to any great extent in present curricula at British universities and one which should receive much more atention than it does at present.

Forest Management: This teaches the inter-relations among the various resources of the forest (wood, water, forage, wildlife, opportunities for recreation) and basic principles of forest land management, including organisation and administration for multiple use, sustained yield, etc. The subject covers a wide field and offers an opportunity to integrate all the other subjects in the consideration of the management of the forest as an entity. This concept of forest management should again be brought into British curricula. At present, little reference is made in them of anything other than the timber resource of the forest.

Other Subjects: Logging engineering is also taught as a main subject at many universities particularly in the west.

There is at present much controversy in the United States about the amount of cultural subjects taught during the forestry course outside the professional field of forestry. The desire to include more and more of these e.g., English and Literature, Social Science and general communication fills the present four years course to the extent that at many Universities serious consideration is being given to the formation of a five year course as a requisite for professional training in Forestry.

In this country with our higher standard of pre-university education many will argue that the inclusion of such subjects would not be required. However, the sad fact is, for example, that the standard of general communication has dropped rather than improved during the last 10-15 years. British and Irish curricula could also take a leaf from the American book by including subjects like accounting, personnel management and business law.

As well as these subjects, I submit that our curricula would benefit greatly from the inclusion of *courses* in, not just passing reference to, engineering, elementary aerial photography and statistical methods, although in the United States this is often left to the graduate school.

I would now like to comment briefly on the missing subjects or partially covered subjects in our curricula—bearing in mind that their fuller coverage or inclusion could over-tax our already loaded academic terms.

Statistics is a subject which often gets little more than lip service in British and Irish Universities and yet is a subject basic to many aspects of forestry. A knowledge of the complexities of statistical sampling are essential, I feel, for a thorough understanding of mensuration and also for an understanding of research work. We are often overawed by the use of such terms as regression analysis, chi square, significant at the five per cent level and even such simple terms as weighted average. However, in being overawed we are ignoring the fact that these are tools of forestry just like the chainsaw, the scale rule and the hypsometer.

Aerial Photography is being used more and more in forestry and other subjects for example, geology and engineering. It is taught at a very large number of forestry schools in the United States and I feel that it has got so much importance in this country that it should be included in forestry courses here. When I mention the uses of aerial photography I do not mean the use of photographs in making topographic and precise planimetric maps, but of the everyday use of photographs in mensuration, management and silviculture.

How instruction in aerial photography should be incorporated in a forestry course is not for me to say. It will probably be found, however, that if other university curricula are considered, that courses in aerial photography are being given in the engineering department of the university or perhaps in the department of geology. A combined course for the basic work should therefore be highly possible.

Forest Engineering/Logging Engineering:

Until the appearance of Mr. Huggard and his textbook on Forest Engineering (Huggard, 1958), little was taught in British universities about this extremely important aspect of forestry. If we only consider roads, the profit/loss margin of a forest crop can be determined by road espacement alone. While Huggard's book certainly fills a gap, we could ask ourselves again does it do so completely or does some space yet exist which could be usefully filled. Can we not again, like the American, take a look, or a longer look as the case may be, at such fundamental things as road width, the degree of curvature, the number of curves per mile, the type of road surface, the density of

the traffic which the road will eventually carry, the spacing of passing points and their visibility and the effect of these on haulage costs. We should also, I feel, be able to pinpoint such things as the optimum truck size and horse power required for certain haulages and road types etc.

Communication:

Of the many courses taken in my graduate programme, perhaps "research methods" was the most enlightening. To describe this course in full would perhaps steal the next speaker's thunder, but I feel I must dwell on one aspect of it—that of scientific writing. This is the art of writing for a profession and not a public. It is meant to inform rather than entertain and is for journals and technical papers which, due to the cost of production must be kept to minimum acceptable size. This is a subject that we should think strongly about, because few of us are capable of producing a creditable short, precise, logical report, memorandum, or even letter. British and Irish universities could well include a course on this subject in their curricula. Americans accept it as a necessary subject—but British graduates in the United States almost reject it out of hand. To quote Thirgood (1961) on this subject—"The British and the Americans are one people divided by a common language, so says George Bernard Shaw". Thirgood states that especially in the field of scientific writing, British and Irish students experience very real difficulties. He states further that the sentence form of the Briton and Gael :—

> "is long with supporting and amplifying phrases. He is accustomed to a syntax that to North American eyes may seem unnecessarily literary, verbose and complex. If obliged to attempt an American style he will feel restricted. In his reading he may find North American research writing disjoined and disconcertingly lacking in continuity".

I must confess that for a while I recognised some difficulty and I also agree with Thirgood that my difficulty was unrecognised by my major professor. However, I soon came to see the American point of view and I now accept this form of scientific writing as perfectly normal, logical and proper.

However, communication is not report writing alone, there is much more to it than this and it is stressed continually at American universities. For example, in the journal of Forestry (Garrett, 1959) we read that by and large there is a general agreement among most United States forestry educators that the forestry schools there are doing a creditable job in the technical preparation of their graduates for the forestry work in hand. However, it is stressed that emphasis continue to be given to the forester's need for improving his ability to communicate . . ..

> ". . . to transmit his ideas to his business and professional associates and to the general public through effective writing and speaking. In fact, whether it be in preparing and submitting reports to his superiors to account for his activities or stimulate action programmes, or in engendering goodwill for his company or agency among laymen and public organisations with which he comes in contact, ability to "sell" his ideas may well be one of the forester's most effective attributes. It will have a large bearing on his ability to motivate and work with the people in his own organisation ; it will have an equally important bearing on his ability to perform an adequate public relations job in dealing with a wide range of actual and potential critics or supporters of the policies and practices of the organisation he represents and in improving public understanding of forestry and recognition of its professional opportunities and responsibilities."

George A. Garrett in his article "Education for a Profession" (1959) continues :—

> "Better than average command of English, knowledge of huamn behaviour, and appreciation of the arts will all combine to improve the foresters' standing in the eyes of the general public. The opportunities for the forester of the future to lose himself in woods or in the laboratory will become fewer. Most foresters will be judged by the public for whom they work or with whom they come in contact, more on their possession of abilities and skills than are, or should be, common to all people of broad educational background, than on demonstration of professional efficiency".

After five years I now feel more strongly than ever that communication has an essential part in our profession. Indeed it is interesting to note that the Agricultural Science Association of Ireland recently held a two day symposium on this subject. We can use the knowledge from courses in communication in the preparation of technical material and leaflets which will eventually be read by farmers, youngsters and the public in general. At present most of this literature could do with an objective inspection, and we could ask ourselves quite often is this information written especially for the person who is going to read it. Also we could brighten up our literature and give it more reader appeal. What could be more forbidding than many of our advice pamphlets for farmers and the public.

A facet of American education which I feel bound to refer to is their attempts to develop the thinking and reasoning processes of students. I will therefore call this section of my paper :—

The Reasoning Mind

I was extremely interested in the ultimate goal of education at the particular university I went to and I believe that this university was not unique in this field. Dean W. F. McCulloch made the following statement :—

> "The scientific method is an integral part of general education and, should be an integral part of forestry instruction. To attain the goal of scientific forest management, the forestry school should hold to a sound basic education, developing a minimum of specialised techniques, and a maximum of ability to think scientifically. Development of the ability to think is so difficult that it absorbs college time which might otherwise be spent on more techniques but this is not necessarily a loss to forestry. The reasoning mind is effective in all fields, techniques to a limited few".

It would appear to me, having been exposed to the American system of education and research after a period of indoctrination under the traditional "Old World" system, that the American tendency is to develop a most inquisitive nature — to question everything at all times—the European will very often accept more things as being fact and will not question them. With the American it is different. Dean McCulloch tells of the forester from a "distant land" —somewhere in Europe—quoting an alleged authority, while visiting the Pacific north-west, to the effect that hemlock seedlings would not germinate on duff. It was pointed out to him that he was at that very moment standing on duff literally carpeted with hemlock seedlings. The visitor was not taken aback. He said, "If that's duff, then those are not hemlock seedlings, because hemlock will not germinate on duff".

How is the development of a questioning mind achieved in the United States Forestry Schools ?—to quote McCulloch :—

> "It is possible in college to develop scientific precision by rigid adherence to the highest professional standards in all that the school does. It is possible for the instructor to develop a questioning mind in the student through the example of his own questioning mind. It is possible to develop critical appreciations through persistent use of problems requiring accurate analysis. It is possible to develop this mental alertness and active imagination through sympathetic and inspiring teaching. Any school can do this, and all should".

The underlying reason for this persistent inquisitiveness and reasoning ability is the type of university education system that one finds in the United States. There they have a doctrine of student participation with a pattern of prescribed readings, quizzes and assignments.

The "Old World" student in essence finds himself back at school and does his homework nightly and obediently. Class participation soon sorts out the laggards, and in American Universities they are not tolerated. There are too many applicants, particularly in graduate school, to waste time.

In our traditional system, textbooks contain the complete course and indeed, the so called lecture notes given by many lecturers are indeed précis of the textbooks. It is possible for a British or Irish student to pass his examination having read, say, only two textbooks. On the other hand, I feel, that the American system is more ideal,

textbooks are certainly used but also are technical journals and research papers, to a very large extent. In order that the amount of reading may be reduced as far as possible, prescribed reference to specific pages and even to paragraphs in these books are often quoted. This exposes the American student not only to the views of one or two experts but to the views of many people. This, in itself, develops the mind since it lets the student see that one man's view is not the be all and the end all of that particular subject.

The Place of the Graduate

There has been for the last number of years, and there is now, a tremendous stimulus towards graduate study in the United States. Graduate study is now being stressed to such an extent in forestry education that many men upon receiving Bachelors degrees decide to continue their studies for an additional year or more. With the enrolling of students in, or heading towards, forestry at an all time high, it is easy to conclude that the best equipped men will ordinarily have first call on the better positions. Competition is bound to become so keen as to stimulate interest in graduate studies. This then is the situation in the United States. It is a great pity that it is not similar in this country. George S. Allen in the Forest Conservation series of lectures given at the University of British Columbia entitled "Facts, Fiction and Forestry" stated :—

> "The most effective contributions in silviculture are likely to be made by a man who has had advanced training in ecology and soils as well as a broad forestry background and experience".

How does one get this advanced training ? — in this country only by either an Honours degree or a post-graduate degree. But what incentive have we ? — we cetrainly do not get paid according to qualifications, and, let us face facts, it is doubtful if there is any promotion reward for qualification either. I feel that it is time that an incentive was created—one could say here—'wake up, it is later than you think !' It is too late to look around for the men with the increased knowledge when the problem has arrived and must be set upon immediately. Having exclaimed dissatisfaction with our own country, let us look again to the United States. How does that country look upon graduate study, and what does it really constitute ?

For an answer let us again turn to "Forestry Education Today and Tomorrow"—The characteristic of graduate study is :—

> "that it throws the student largely on his own resources, with the opportunity to develop initiative, scholarship and sound judgement under the guidance of a graduate faculty. It may be primarily professional or scientific in character. If the former, its object is to strenghten the student's ability as a land manager, administrator or executive in a forestry enterprise; if the latter, to strengthen his ability as an investigator or teacher.

> "Graduate study, that is essentially scientific in character, usually requires a minimum of three years beyond Bachelor degree, in order to qualify for the degree of Doctor of Philosophy often, as an intermediate step, a science orientated student will earn the Master of Science degree which provides a foundation for doctoral work and also the backkground for teaching and research. On the other hand, graduate study that is essentially professional in character is limited to a single year beyond the first professional degree and leads to the Master of Forestry degree. The forest practitioner who wishes to round out his education in some particular branch of the profession usually finds that additional work at the graduate level is worthwhile."

I have already intimated just how worth while it is in our country. I have also said that we should wake up. We need hardly be unique in feeling that we can forever dispense with professionals beyond the primary degree standard.

This is an aspect of American education which I feel could be copied to our advantage. In America as in this country, the forester often finds his duties increasing in the administrative sphere. He finds himself dealing with fields outside his formal education, fields in which he cannot hope to become technically competent. The Americans realise that here is a challenge and a necessity for post-graduate education via short courses, seminars, institutes, conferences and other forms of intensive specialised instruction. An example of the subjects that are dealt with at such courses are : new developments in forest practice and research, taxation, legal problems, business adminisration, fundamentals of supervision, labour relations, effective speaking and report writing.

Such courses are popular in the United States and the profession there owes some of its extremely high standard to them.

So much, therefore for "academic education". I must pass on, but before I do, let me leave another quote with you — that of a Yale colleague of the famous George Garratt

> "The coming generation of foresters more than ever must be educated for profession rather than trained for a vocation. The rapid pace with which our civilisation is developing may well tend to leave foresters behind if we continue to emphasise technical training based on our past experience and concepts".

We have now looked briefly at American forestry education, both undergraduate and graduate. What have we seen? Basically much the same practitioneer education as our own but more orientated towards Science. The end product, I feel, gives a sounder ecological basis for land use and forest management coupled with a background of economics. We have, by virtue of their training, men better equipped to be administrators. The end product demonstrates the value of an argumentative and open minded student life achieved by contact with a research trained faculty. Admittedly in Britain and Ireland, this fresh academic air has started to blow and

the days of the practitioner trained "status quoists" are rapidly receding.

THE PUBLIC — EDUCATION OF

So much, therefore, for the education of the forester. However, an even greater field now presents itself, that is, the forestry education of the public. In commencing this section of my paper, may I be forgiven for again quoting, this time from M. N. Taylor in his paper "Trees and People" (1954).

> "From the time a girl called Eve reached up and plucked an apple from a tree, the impact of trees upon people and of people upon trees has influenced the destiny of mankind. In the Garden of Eden public relations between trees and people stood at an all time low".

To-day the United States public relations has reached an all time high. This is the method of selling forestry, forest conservation and all the different facets of forestry to the public and of developing an awareness in the public of their responsibility towards their country. But high and all as public relations may be there is no time for complacency.

Gregg (1959) states :—

> "We are just beginning to understand a few of the basic facts of public relations as they affect the problem of fire prevention, but we have not been deeply interested in the broad problem of human relations and their effect on a business enterprise".

This surely could apply equally well to our own country.

With this introduction, I want now to briefly look at public relations in forestry in the United States dealing with each particular branch and facet of it in turn.

Many different bodies are implicated in this "big sell", perhaps the largest of them the Federal Government and the various States who together provide assistance to the owners of small woodlands. This branch of public relations comes under the heading of extension forestry and it provides educational assistance to owners of farms in establishing, renewing, protecting and managing woodlots, shelter belts, wind breaks and other valuable forest growth, also in harvesting, utilising and marketing the products thereof. This public education programme is basically similar to our own. However, since it is entrusted to extension officers with no other duty, a closer contact with the individual is maintained and better results achieved. Admittedly, woodland owners are more tree conscious in the United States but one cannot help feeling, that, if not a separate service, then at least separate officers are required in this country. Forest Officers have not, normally, the time required to do the job as thoroughly as it should be done.

Although it is not directly an educational programme as such, I feel that the great *American Tree Farm System* is worthy of mention here, due to its insistence on a forward attitude towards forestry by demanding that woodlands are managed in accordance with the best forestry practice. This is a nationwide programme designed to encourage the practice of good forestry by giving public recognition to land owners who are properly managing their woodlands. The programme has, to-day, thousands of members, from bankers, doctors and factory workers to farmers and lumber companies. The minimum area required is three acres and there is no maximum. The programme is dedicated to continuing growth of forest crops for man's use. For small areas, advice and assistance comes directly from State or Federal sources, but advice usually to larger owners is available from Forest Industries. Certified tree farm owners receive certificates to state that their properties are being protected and managed under conscientiously applied forest practices for the continuous production of commercial forest crops. They also receive distinctive signs for erection on their property for public information.

This programme was started in 1941 by progressive forestry industry leaders who recognised that more of America's woodlands needed to be put to work growing continuous timber crops to meet the nation's increasing demand for forest products.

Here then is "a thought for to-day" — that forestry be made to appear more of a business adventure to the private owner. What better way of getting industry interested in the growers. We hear, every day, of our forest products industries screaming for raw material. What guarantee have they that in 20 years they are still not screaming? What better way to turn the scream into a groan of pleasure than to contract with private land owners to grow their raw material for them. The American Tree Farm System in this event would at least be a basis to start thinking about.

The next organisation worthy of note is that of 4H — a youths organisation, very similar to the Young Farmers' Clubs and Macra na Tuaithe, the members of which work out for themselves principles and theories they have been taught (usually by the extension forester). The project method is thought to give a better understanding of subject matter and it develops a plan of reasoning. The youths obviously then work these improvements on their parents.

The United States Forest Service

The main contribution, apart from extension forestry, of this great service is in teacher training. This is much like our own methods, and training is both "In-" and "Pre-service". The teaching is again conservation. The Forest Service provides simplified textbook material and supplementary teaching aids both written and audio-visual. Talks are given and nature trails are set up. There

is not much we can learn from this section of Public Relations except that it behoves us to take a special look at the type of literature they prefer. Obviously this branch of education will eventually react on the children, therefore, the literature must have that child appeal. An example of this is the Smokey Bear — "Story of the Forest". This type of literature appeals at first glance to a child and the Forest Service set out to get through to the children and through them work on the elder section of the population. There is no doubt that they certainly achieve their object.

Another section of the American community — the American Junior Red Cross, is of passing interest only, but its objectives are interesting. It is organised by the schools because forest fire disasters have been among the worst in which the Red Cross have been involved — the organisation via its Junior group co-operates in teaching, not only principles of forest fire prevention in schools, but extends its interest also to all aspects of forest conservation.

Time does not permit mention of more than a few of the numerous organisations dedicated to advancing better use of American forests, *e.g.* the thirty thousand member American Forestry Association which is a citizens' organisation founded in 1875, the Charles Lathrop Pack Forestry Foundation and the American Tree Association.

The American Girl Scouts and Boy Scouts like our own Baden Powell Scouts confer badges for efforts that include a knowledge of tree species and the uses of different species. It also teaches planting and protection. These organisations and the American system are very similar to our own. The moral here is the way the project is fostered by the Forest Service in that it is not just another drudgery but a work recognised as very important by every manjack and lumberjack.

The next section that I wish to deal with at length is the American products Industries. These industries encourage several programmes principally the great "Keep America Green" programme. This is popular education in forest fire prevention. Many states organise their own "Keep Green" programmes. The first "Keep Green" programme commenced in Washington in 1940 and after that came Oregon, Minnesota and Idaho with their own "Keep Green" programmes. These organisations published their "Keep Green" pleas via posters, decals, table mats, place cards, ashtrays, newspapers, TV, radio and even car licence plates.

While the big "Keep Green" movement is for everyone, the main appeal has again been to the youngsters. Oregon has, for instance, its Green Guard for boys and girls between 8 and 16. The purpose of this organisation is again to remind people via the children of the dangers of fires, not only fires to forest and range, but also to property.

The great American public appeal is, however, for forest fire protection and this section cannot be let pass without mention of America's number one gimmick, that of Smokey Bear. I have previously written at length (Dallas, 1961) describing how this programme started and also Smokey's story and history. This programme is of note, not so much because of the actual physical nature of the gimmick, but of what and how it works. It aims at the children and possibly many adults via their personal feelings for wild life.

The moral of this story is not, however, that we should immediately jump for an animal gimmick such as Smokey or his old Canadian rival Benny Beaver or his new partner "Howdy", the 'Good Outdoor Manners' Raccoon. We should first of all logically consider what appeal wild life has got in this country. We must develop and sell conservation and then, for instance, work upon the farmer's children telling them of the effect heather burning has on baby grouse. Also, the more we develop our sporting facilities, such as our moorlands and our mountains and lakes and open our forests to the public, the more we will get through to the outdoor folk — and, after all, they are the people that matter. In them we will have a fine nucleus to form any gimmick pressure group. An interesting fact is that the Smokey campaign is financed from Federal funds, State funds and, note well, the American Lumber and Products industry alone contributes fourteen million dollars annually.

On our side of the fence we must remember that if our forests are worth saving then a proper fire publicity programme must have its cost. The Ministry of Agriculture in Northern Ireland have gone a long way to make the public there fire conscious, but they are only part of the way. Their campaign must not be allowed to stagnate, it must be kept dynamic and up with the times to guarantee full success. Our friends in the Republic, have however, to think pretty well from the beginning — but it is hoped in doing so that an even better end result will be achieved. It is hoped also that when they do make an effective move and, say, consider adopting a symbol such as the United States, that we all recognise the fact that trees are equally green on both sides of the border, and that there is a tie-up between campaigns.

It may be of interest here that the Governments of Mexico and Canada have negotiated to obtain legal rights to use Smokey as their forest fire prevention symbol. It may be equally interesting to know that the Forest Service and the Forest Products Industries do not conduct the campaign on their own, but use an advertising agency. Growing and protecting trees, they say, is a foresters' job — selling to the public, a job for the professional advertiser.

Forestry and the Irish Public in general

We have now seen in outline at any rate, a few of the great

publicity campaigns of the United States — aimed at preserving a most valuable natural resource. My plea at this stage is that, while we are doing a considerable amount, and spending a considerable sum on it, we must do more. As our forest area incraeses, so must also our campaign to make the Irish people aware of the fact that timber is a crop — a raw material for forest products industries that are an essential part of the country's economy.

However, I find it hard to believe that we should be the sole subscribers to such a campaign. The millers, the defibretors, the pulpers and also the private grower, whose bread and butter timber is, could usefully contribute individually or via their professional or trade bodies. Who knows that the appeal might not be better coming partially from such a source. The job is so big that a combined effort of public and private authorities is required.

May I be forgiven if I quote again George A. Garrett :—

> "Foresters in the future will have to lean more and more heavily on their ability to think and improvise and invent. They will find that their understanding of trees is no more important than their understanding of people. It is already evident that some of the major problems facing our profession will be in the realms of public relations and politics. In our choice of men to succeed us, these factors must receive important attention.

The above is addressed to the American Forestry profession but it could be meant for any forest service.

CONCLUSION

We have now looked briefly at some concepts of American Forestry education and if we have learned nothing else, I hope that one thing sticks — that a forest is not just trees. A considerable amount of this paper has been quotation, therefore it would not be out of place to finish with a few words from Bramble (1960). He states, when bearing in mind that scientific forestry commenced in the United States with the coming of men like Pinchot and Graves, that

> "The effect of European traditions on forestry was good. No nation stands alone in scientific and professional advances and only a foolish man fails to use the knowledge gained by others as a springboard for newer and better advances, using his own talents".

Let us therefore, then, reverse the original trend and change our outlook and our basic philosophy of forestry, just a little, so that it may be said "The effect of American tradition on our forestry was good".

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Is Our Approach to Forestry Research Adequate?[1]

By LEONARD U. GALLAGHER[2]

Summary

The original motivating forces in European and American research are outlined. The concepts of basic and applied research are defined and discussed. The methods of handling research and research problems are discussed with particular reference to points of difference between the Irish and American approaches and the significance of the fundamental approach. Aspects of communication are discussed, with pointers on standardization of technique in scientific writing, and the need for better communication with the public at large.

INTRODUCTION

AS has been the case with most fields of scientific endeavour, forestry research evolved from the practical need to increase forest productivity to supply a growing market. A resumé of development in the field of sustained forestry yield shows how management in European forests progressed through the centuries. Evolution of thought and development of the scientific approach are illustrated in the following stages of advance in management techniques.

As early as the ninth century impositions were placed locally on land clearance. In 1305 Petrus de Crescentiis made the first suggestions regarding artificial regeneration, but it was not until 1368 that, at Nurnberg, the first forest seeding took place. This trend of human interference was slow to develop in the beginning as the resources were large and the need to conserve and replace was not apparent. An early example of a projected view of forestry can be seen in some of our oak woods established and fostered to provide timber for the English navy.

Yield control as a legal measure preceded silvicultural techniques, but with the development of silvicultural systems the foundations for scientific investigation of management problems were established.

To quote a few early examples we note that in 1669 the area division method was prescribed for all French forests, and that in 1791 Hennert produced the first yield tables. Again we can see a slow early progression due to limited need to organise and rationalise.

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1. Text of a paper read at a symposium on "Aspects of American Forestry of Interest in Ireland" at Pomeroy Forest School, Northern Ireland, April 22nd, 1965.
2. Scientific Officer, Timber Department, Institute for Industrial Research and Standards, Dublin. W. K. Kellog Foundation Fellow, 1961-1962, University of Washington, U.S.A.

From this the pertinent fact that research in European forestry developed out of traditional approaches to management becomes evident.

In the United States of America forestry, even at the turn of the century, was hardly a science, hardly an art, but mainly a matter of exploitation of natural resources. To quote Fernow (1891):

> "Of all the natural resources reserved for our use it is the most directly useful, for in the forest we find ready to hand, without further exertion than the mere harvesting, the greatest variety of material applicable to the needs of man, the means to satisfy every direct want of life".

I do not wish to quote Fernow out of context, for he continues by defining the goal of management as being the production of the largest amount of the most useful wood in the smallest area possible and with the least expenditure of energy or money. To achieve this obviously requires considerable thought and planning and cannot be conceived of as purely an exploitation approach. With reference to the previous paper, one can see that the above quote appeared six years before there was a definite government policy for timber lands. However, much of American forestry, particularly that undertaken by the timber industries, was mere exploitation, and it has only been in recent times that the realisation has come home to them that the future of the American forests may well be in jeopardy unless steps are taken to conserve them by proper management practices and to improve productivity by conducting research over a wide area of silvics and silviculture.

As has been stressed in the first paper, a growing realisation that forestry properly must be thought of in terms of multiple land use has led American workers to investigate the forest in relation to watershed management, soil stabilisation and recreation, and other facets. In this the lack of tradition has been of considerable value. The enquiring mind is not set, is not biased in favour of one scheme or another, and is without preconceived ideas on how a job should be tackled.

RESEARCH IN GENERAL

To develop a discussion on science in general is out of the question here, but certain aspects of research in its broadest meaning bear thinking about in relation to our approach to forestry research.

Research is generally classified under two main headings — basic and applied research.

Basic Research

Although Stone (1957) tends to classify basic research as that which is oriented towards determining why, others who have attempted to define it consider it more as a quest for knowledge irrespective

of its applicability. Frequently this envisages the "why" of a phenomenon, but not necessarily so. By elaborating on Polanyi's definition of pure science (Polanyi 1939) we can say that:

> Basic research is essentially the study of the fundamentals of our universe and all that pertains thereto for the sake of knowledge and truth, regardless of its implications in the world of man.

Applied Research

Applied research may broadly be defined as the application of scientific knowledge and techniques to solving practical problems.

Examples of these concepts I have seen at work in the State of Tennessee where the radio-isotope Cesium^{137} was used to study the cycle of elements in a tree crop as a factor of growth and metabolism (basic research) and could also be used as a substitute for potassium to study the effects of fertilisation on the cycling of this element—a guide to fertiliser requirements (applied research).

Unfortunately, a strong degree of antagonism exists between protagonists for the two spheres of research and our enlightenment has not yet arrived at the point where the need for basic research is universally accepted and it is often considered by those involved in basic research that theirs is the only true research, the work in the applied field being hardly more than manual labour. But this contention that exists between basic and applied research is meaningless. The snobbery existing between the two fieldse as illustrated by Polanyi (1939) and Beveridge (1957) is ludicrous. I prefer the idea portrayed by Julian Huxley (1936) who said:

> "People have realised that practical problems can be solved by handing them over to the pure scientist, even if for a time his work seems to have no relevance to practice, and basic research has been interposed as a link in the chain between question and answer".

Applied to our own immediate concern with research in forestry E. L. Stone (1958) makes the plea:

> "Perhaps our test of good forest research should be not whether it is basic or non-basic, but rather is it relevant; is it well done; will it reduce the degree of empiricism in its area?"

To present the approach by which the above questions may be answered with a "yes!" is my intention in this paper.

THE PROBLEM

The basic problem in all science is the question. To quote Synge (1951):

> "Contrary to popular belief it is harder to ask than to answer".

This idea has a special bearing on forestry research because of the nature of the material we work with. With a simple subject

one can formulate comprehensible questions and, more than likely, one can set about answering them without undue difficulty.

But forestry is not simple and the difficulties lie in:

(1) The length of time trees take to grow. This means there must be a considerable time-lag between the initiation of an experiment and the analysis of the results. It is one of the primary reasons why forestry research, not only in Ireland but throughout the world, is still in its infancy. Although much work has been done a great deal of it is inconclusive as yet as the experiments are not terminated — and many remarkable experiments will still be running in 20 years time!

(2) The complexity of the environment rarely allows of clear-cut answers. This means that experiments are either extremely complex or else must be repeated a number of times, or both, before we can be emphatic in our deductions.

(3) The nature of a forest is such that any field experiments are of necessity cumbersome — large tracts of land, large trees etc.

These three factors lead to a certain hesitancy to become "too involved" in research projects. But worse, they may also lead to a hit-and-miss approach to applied forestry research.

Although much of the basic research that has been done has been of the nature of following hunches, or the cut-and-dry type referred to above and as such has led to remarkable discoveries (Conant, 1961), it is not an approach that should always be recommended. This is a suitable basis for the genius, but not for the ordinary research worker working in the applied field.

Thus we are faced with the necessity of planning research. To this idea of planning there are many protagonistic and antagonistic arguments. There is validity in both views, but the main distinction is more a matter of degree. Public resistance to discovery is a useful buffer against a too hasty acceptance of new ideas until they are well proved and tried (Beveridge, 1957). The fear of being swamped by new-fangled notions may also be the clue to planning research. By this I do not mean that freedom of expression in research should be denied. This should never be. But I do suggest that general objectives should be aimed at in research establishments concerned with applied research and that these objectives should be stated in a written programme. This idea is very neatly brought into practice in the Forest Research Division Manual (1956) of the B.C. Forest Service. There the Research Division is mainly concerned with applied research, and they have devised their programme to suit their needs. However, on close analysis of this programme, one can see that the terms of reference are quite broad. It is designed in such a way that the work of the research officers is controlled without being really curtailed. If a man in the field has a good idea, or any idea, he will be heard and, on consideration, will be

given either the red or green light. The main thing is that a programme is devised so that there is coherence within any one area of research, that there is association between areas to make the work as relevant and complete as possible and that there is an overall pattern which can be followed and is so recorded and filed that it is readily accessible for observation leading to completion, expansion or rejection of the work.

The field of basic research presents another picture. In applied research it is the project which is given support, whereas in pure research it is the man (Beveridge, 1957). In the latter case we are talking of a man of exceptional merit whose work should not be interfered with, and should not be controlled by set objectives. He should, rather, be given scope to fully express himself and, sooner or later, he will contribute material of lasting value, and most likely, of eventual applicability in the applied field. Essentially he is feeding information into the fund of knowledge, which is of itself a worthwhile objective.

We have digressed somewhat from the three-fold problem facing the forestry research worker. On reflection of the points (time-lag, complexity and cumbersome nature) we find that, should we have a programme we are in a much better position to take the individual parts of this programme and elaborate to see how far we can work on them. A problem examined a piece at a time is far less frightening than trying to encompass the whole. But these three fates are likely to be present in any item on the programme and, logically, can be interpreted in one of two ways.

(a) We accept the limitations imposed by the time-lag, the complexities, and the general awkwardness of field experiments and we act accordingly, or

(b) We try to find a short-cut. *Caution*—should we find a short cut we must realise that this in itself will have limitations—relevance of extrapolation which in many cases may be quite an unjustifiable procedure, and so forth.

The development of a reasonably well-organised programme will help to assign experiments to (a) or (b) and will help also in projecting the value of either or both of these approaches.

The main thing is that, in forestry, we have these problems. We cannot stick our heads in the sand and forget about them. We are, in fact, so surrounded by pressing needs in the whole sphere of forestry research that we have had to put priority on certain subjects. While it is axiomatic that first things must be treated first, a great deal of relevant material tends to be pushed aside, often without realising what is being lost and without seeing where a knowledge of the fundamentals can give great assistance in promoting the development of directly applied research and its interpretations. This has been brought about by a feeling that neither

do we have the time to delve into the background, nor is it in the mandate for forestry research work at the State level in this country. As long as State-sponsored forestry research is the only major research in the field, then these notions must be rejected or else a situation of "the more haste the less speed" will develop. The time-lag factor may also lead to erroneous conclusions and an effect observed after a few years of treatment may have little bearing on the long-term result. In this case unthought-of interactions may occur which would later nullify the initial achievement.

A lot of the uncertainty can be eliminated by using the right approach to the problem, by adopting a method which is sound.

THE METHOD

The greater portion of research in Ireland (and all of forestry research), as indeed in most countries, is applied research — the solution of a specific problem of economic importance by deductive methods, generally evolved from the inductive methods of basic research.

Let us take a hypothetical case which, though it superficially appears to be sound, has hidden dangers for the unwary. By this means I can illustrate further the fundamental approach of the Americans in applying basic principles to the most practical question — how to go about a job that must be done.

1. Problem arises or is appreciated as being of relevance.
2. Consultation shows that it should be investigated.
3. Material is gathered, or plots are laid down.
4. Material is examined, or plots are treated.
5. After examination of material, or measurement of plots, on termination of experiment, a report is presented with conclusions.

Satisfactory? Perhaps — but there are possible pitfalls which are frequently either overlooked or not realised at all.

These are :—

1. The problem, being of some importance, may be treated as an entity in itself and other important considerations may be missed.

2. Consultation may not be enough. A background to the problem must be studied as far as possible — even to rejection of the idea.

3. Gathering of material, or laying out of plots without consideration of all the involvements may lead to wasted effort through inadequate preparation, work on an erroneous assumption or experimentation without design.

4. All aspects of the material or plots may not be recorded, and relevant data may be missed that cannot be recalled due to

being obliterated in the experiment or confounded my superimposed treatment.

5. Should the above be the case, how can one present a report?

An approach of a rather different nature has been evolved in America. This has been, for them, an easier job by far because of the nature of the American people and their background which is unhampered by tradition. In the American environment utility and hard reasoning have evolved from the pioneer spirit. This is considered by Europeans as one of their shortcomings, and perhaps in the arts the results leave much to be desired. But in research this has some considerable advantages in that a fundamental approach has developed. They do not have the inhibitions frequently generated by traditional "schools of thought". Matters are pared down to the essentials and from there on they can, if necessary, be built up. If analysis shows that background information is lacking the first step is likely to be an attack on fundamental problems before approaching the immediate question and, assuming that there is a need for this, they consider the money well spent. Do we?

We can again take the problem and re-assess a new sequence of events.

1. The problem arises, and in the case of applied research is generally noted to be important.

2. Consultation shows that it should be looked into.

3. The observed facts are recorded as well as possible and assessed. From the assessment a statement of the problem is made.

4. All reference to this problem is sought and on analysis should yield information of the following type:—

(a) The nature and extent of earlier work in this field and the conclusions arrived at.

(b) Possible pitfalls.

(c) Details of possible methods of approach.

(d) Interactions which should be noted or possibly eliminated.

5. Further discussion decides whether the project should be accepted or rejected.

6. A final concise statement of the problem is made in the light of new knowledge. This is formulated in terms of a *Working Hypothesis.*

7. On the basis of the working hypothesis a method by which the investigation is to be carried out is set up and is strictly adhered to, unless there is a strong and valid reason for changing technique.

8. The experiment is set up, great care being taken to eliminate heterogeneity and human bias. Where the former cannot be eliminated sufficient samples are taken, or plots established, to cover the possible variation. In other words, the experiment is set up according

to a statistical design that will stand up to rigorous examination for validity.

9. In recording the experiment sufficient data are collected in an objective way to eliminate human bias and allow an assessment to be made that will ensure that the results of the experiment are an expression of the truth.

10. Any report presented must be such as to be a statement of fact. Any conclusions made must relate specifically to the evidence, and where this is not strong no positive conclusion can be made, although subjective interpretation may be made if it is stated as such.

The mehod of handling the problem outlined above is obviously more complex — there are 10 steps where before there were five. What of these five added difficulties? Unless they serve a purpose they are worthless. As I trust I am not pouring out worthless suggestions let us see what new contributions they make.

In essence their purpose is to reduce the degree of empiricism in handling research. The first two points do not vary — they are merely an appreciation that there *is* a problem.

The third point presents a radical departure. This is that a full preliminary investigation is made and that consequent on that one makes a statement, i.e., one commits oneself (though not irrevocably) to a line of thought. The value of this is that it forces the observer to coherent thought, it points out problems and reveals complexities and it tends to make the observer, or research officer, aware of what he has to face.

Point 4 — reference — has much to recommend it. However reading must be tempered with reason. Beveridge (1957) warns against believing everything one reads and also allowing reading what others have written on the subject to condition the mind to see the problem in the same way and make it more difficult to find a new and fruitful approach. Many workers have achieved great things with little or no scientific background to their work (e.g. Bessemer). But I would like to quote him further:

> "The best way of meeting this dilemma is to read critically, striving to maintain independence of mind and avoid becoming conventionalised. Too much reading is a handicap mainly to people who have the wrong attitude of mind. Freshness of outlook and originality need not suffer greatly if reading is used as a stimulus to thinking and if the scientist is at the same time engaged in active research. In any case, most scientists consider that it is a more serious handicap to investigate a problem in ignorance of what is already known about it".

It is very important to read critically, and a frequent mistake is to believe too much, not to distinguish between the results of experiments reported and the author's interpretation of them. Therefore, in assessing the conclusions presented in scientific articles, we must weigh up what is objective and what is subjective in them. But there can be no doubt that if one is embarking on a project

which is somewhat outside one's normal experience a large amount of reading *must* be done before any work is attempted—to follow clues, to avoid pitfalls, to assess methods and to evaluate the effects of interactions.

Then comes the final discussion. The case comes up for trial, or to carry the analogy further, it is rather like the taking of depositions. All witnesses are called — in the form of observations and literature references — and from an evaluation of the statements made the accused goes on for trial or is discharged. Here, of course, a lot of modification may be introduced, and a weak case may be so modified that it then becomes a strong one. Discussion is invaluable as fresh minds are brought to bear and may reveal striking weaknesses not noticed by the researcher because he was too close to the problem and too bound up in it.

Assuming, then, that the project is accepted the formulation of the working hypothesis gives the research worker a framework in which to operate and also lets everyone know, both up and down the line, just what is going on. If these objectives are to be achieved the working hypothesis must be clearly and concisely stated and it must also be a full statement, not of every detail but of the nature of the problem to be solved.

Obviously the method employed in the execution of the experiment is of paramount importance. All the previous research and discussion will be to no avail if the set-up of the experiment is faulty. Likewise meticulous observation and recording will be useless unless the factors observed are those required, and unless the methods by which they are recorded are above reproach. How many publications have been issued that on crticism have been as watertight as a bottomless bucket? Much early experimentation, particularly in the basic field, was of a beautiful black-and-white nature. Boyle's work in the 17th century had this element, to quote but one (Conant, 1961). Both this writer and Beveridge (1957) show how a great deal of immeasurable value arose from a flash of intuition in which black-and-white hypotheses were stated. Where they do occur the main methods of attacking them may be as follows:

1. Method of description and classification. This has limited application and is mainly confined to the discovery of new organisms and materials.

2. Evolutionary method. In this comparative or genetic method common origins and relations are assessed.

3. Method of determining causal connections. This entails simple inductive methods in which one variable in an experiment produces a certain result. This factor may be determined by noting the absence of the said result when the variable is not employed (factors a.b.c.d give results w.x.y.z and a.b.c give w.x.y, therefore d gives z); by noting results of varying strength when the value of the variable is altered (a.b.c.d_1 give w.x.y.z_1, a.b.c.d_2 give w.x.y.z_2, etc., therefore

d gives z); and by observing the said result appear consistantly when the factor is employed with other variables (factors a.b.c.d give w.x.y.z, e.f.g.d give t.u.v.z, h.i.j.d. give q.r.s.z, etc., therefore d gives z), to illustrate a few of the techniques.

In many of the above the cause and effect are clear cut. If it is mere cause and effect where cause "d" gives effect "z" then the system is a "stop-go" one (Riker and Riker, 1936).

There are still areas where this virtual utopia of science exists, but they are few and far between. Mostly we measure things by degrees of difference — greys of varying tone are introduced. In forestry research we can say, almost emphatically, that it is among the greys that we work. So the question emerges: when is a grey not a grey? This is no facetious question, though it may appear so. Response to fertilisation, the effects of breeding, the results of provenance trials, the response to thinning — these are all measured in degree, the answers are shades of grey. As trees generally grow without fertilisers, or controlled breeding and so on the problem is not a "stop-go" one. Add to this the confusion caused by variability among trees, between sites and even within sites and the variability of climate from year to year and you find that even the refinement between shades of grey becomes important. Now, you cannot say that, because the complexities are so great, you will ignore them. Do this and you will find yourself out of your depth in no time. The answer lies in the design of the experiment. Patterns of design have been evolved — randomised block, latin squares, etc., as also have proper sampling techniques. This evolution is the result of applying statistics to research.

In this paper it is impossible to deal with statistical design and analysis, but some pointers may not be out of place. Firstly, statistics must be recognised as a tool to be used by the research worker. The function of the tool is to aid in the resolution of phenomena which are too complicated for treatment by the methods so far considered. The statistical method deals with complex and difficult problems in a scientific manner, It takes into account the laws of chance, eliminates heterogeneity and draws conclusions that fit all the measurable variations. But a word of warning may further be quoted from Riker and Riker:

> "Because it solves problems that can be handled in no other way, it has been misused and its importance has sometimes been overemphasised in the popular mind".

Another word of caution by these authors can best be expressed by using their own words:

> "No amount of statistical technique can serve as an adequate substitute (1) for a direct knowledge of the phenomena under investigation (2) for familiarity with them, and (3) for accuracy in taking records. Careless spots do not come out in the statistical wash".

The above discourse covers points 7 and 8 in the approach

to the problem. Point 9, the taking of records, has also been hinted at but may be elaborated on. One cannot change horses in mid-stream without incurring serious consequences. This sweeping statement refers us back to the experimental plan, and very often it is only at the time of taking records that faults in the plan emerge. The temptation to change the nature of our records becomes very strong when we see that all is not going too well. Though a trite statement, the obvious way out is not to make the mistake in the first place; make sure that the plan is complete and faultless. This is a tall order, especially with forestry research, but every effort should be made to approach perfection — hence the prolonged preliminaries. With good fortune it may be possible to modify the experiment half way through — or even at the end — but the fear exists that, in so doing, objectivety may be lost. Modification generally follows personal bias — either to make the work simpler or to contort the experiment to fit our own requirements of it. If we have a mess on our hands it is unlikely that we can pull the fat out of the fire without scorching our hands, and it is generally wiser to admit to ourselves that we have a mess and do as should be done with a mess — dump it! Naturally this statement does not cover all cases and it should be employed with discretion, but the sense behind it should not be lost.

The analysis of the results is best done by the employment of statistical means. Here again time does not allow for a discussion of these means, but where an experiment has been established according to an acceptable design and where data have been collected in such a way as to eliminate bias it would be shameful waste not to subject these data to the final test of an unbiased analysis. It is amazing how one can get a preconceived idea of the result by glancing at undigested figures, though in most cases, if there are enough figures, one can get no idea at all. Beveridge (1957) warns strongly against the "should-ought mechanism" which has no place whatsoever in science. He also cautions the use of interpolation and extrapolation. In the main the former may be employed with reasonable impunity, especially where there are sufficient data. The latter can be dangerous — e.g. extrapolating growth response after fertilising during the first few years to predict growth rate in 20 years' time or trying to make results of fertiliser greenhouse trials fit field experiments. But often extrapolation may serve as a useful basis for further experiments after a preliminary study.

In the above discourse on the method of approach to experimentation I may have sounded as if these thoughts were completely my own. Would that they were, but they are, in the main, a synthesis of the American approach to scientific investigation. They show, in essence, that the Americans advance cautiously. They do not jump in at the deep end. If there is a knotty problem of check in plantations they do not dose the trees with N. P. K. but go back

to the fundamentals, to basic physiology. To quote E. C. Stone (1957):

> "In view of the few people engaged in forestry research, *non-basic* research appears to be a luxury we can ill afford. Most of the low apples on the tree have already been picked; from now on we have to reach".

This quote reiterates my earlier comment regarding the need for fundamental research. It implies that applied research has almost arrived at the point where no further useful results will emerge without a background of basic research. In many cases we can say that such-and-such a treatment produces a satisfactory response, so what more is needed? But, do we know why? Without the "why" to support our efforts we work in the dark with the possibility that only half the problem is solved, unaware that so much more could be achieved.

The 10th point, presenting a report, is also a most important matter. In fact I wish to devote a special section to this topic, and its wider implications of getting the message across. Even though the previous paper dealt with publicity to quite a degree, there are aspects peculiar to research which may be stressed.

COMMUNICATION

When a worthwhile experiment has been done it is the researcher's duty, not only to report to his chief what has been accomplished but to make this knowledge available to others in the field, and even to the public. Practical advantages for the researcher lie in the publishing of reports in that they help to synthesise what has been achieved, maintain liaison with other workers, and introduce him to more people in the field which could lead to useful co-operation; to these there may be added the increase in stature of the man involved. Basically, of course, publications of any sort show that work is being done and, as will be pointed out later, the advantages to be gained from such a demonstration should be more far-reaching than the confines of the area of research involved. Although scientific communications on forestry research have been presented, we have not done enough, we should be publishing more.

Scientific Publications

The first requirement of a publication is to present the information received. Secondly, it must give this information in a logical and accessible manner. To achieve these aims there is an almost standard method employed in most American scientific journals, i.e.

Abstract.
History and literature review.
Methods.
Results.
Discussion.
References.

We in Ireland have a tendency to balk at the imposition of standards. There is no need to emphasise how detrimental this has been in the commercial field, and it is also something to be appreciated in the field of science. If we lack coherency in our publications then, as these are our means of communicating our scientific achievements to the outside world, we suffer in our reputation as scientists. By use of the headings listed above we present a logical sequence of events and any aspect of the work may be appreciated at a glance.

The abstract shows, in a brief summary, the nature of our work and, to the scientist who has a large amount of reading to do, it shows, at a glance, whether the material is relevant or not to a particular investigation.

The history and review of the literature reveals the background to the work which often points out analogies and shows as well the extent and nature of similiar investigations.

The methods should be concisely stated, quoting references for established techniques, and more detail for new ones as these can be very pertinent to one's assessment of the experiment and also helpful to other workers.

The results are a statement of fact without comment. They can be examined without bias, and should be presented in just that light. Tables and graphs are a great advantage.

In the discussion the scientist presents his own views on the significance of the data. It is here that the relevance of the statistical evidence, if any, can be discussed, even challenged. Very often application of the results may be suggested, e.g. effective levels of fertilisation, remedial treatment for disease, etc.

To have the references compiled at the end of the text is far more serviceable than to have them inserted as footnotes. They are also more meaningful if they are referred to in the text by the author and date rather than by numbers. This is becoming the accepted practice in many American journals now.

Perhaps I may be accused of triteness in the above comments, but frequently a statement of the obvious is desirable as such things may be so obvious that we are not aware of them at all, and so tend to forget them when we are put to the test. A pertinent elaboration on the above can be found in Duffield (1965), written by a man who has spent many years in the editorial field.

Naturally all articles will not lend themselves to this treatment but virtually all reports of experiments will, and it is a positive case of showing advantages in standardisation.

Communication to the Public

Arousing public awareness of forestry and, more than that, stimulating a sympathetic interest in it and its problems can, and

should, be fostered by people engaged in research. This is achieved by publications, reports in the press, lectures and films. All of these techniques are used in the United States whereas we in Ireland have used but one, the lecture, and that to a very limited extent. In this age of promotion almost every conceivable venture can benefit from well conceived and designed public display and to display the wares of forestry in terms of reporting, in digestible form, the progress in research helps to focus attention to this sphere of activity and in so doing draws the public into closer contact with the work and aims of the Forestry Division. I have seen the work of the Soils Department of the University of Washington appear not only in many of the leading scientific journals but also in the local Sunday newspaper, in tastefully prepared brochures issued to the public and also in an advertisement in a nation-wide magazine (which, incidentally, showed the extent of envolvement of private industry in forestry research).

The public is now becoming science-conscious. People can be told what research is doing. The form of the literature would obviously differ from the scientific report. A literature review would not be approrpriate and just a passing reference to the methods used would be employed. More emphasis would be placed on why the work was done, which is normally obvious enough to the scientist. Results and discussion should be presented, but briefly and in layman's terms with a strong emphasis on the possible implication and application of these results. Needless to say, the appearance of such a publication should be eye catching and have an appeal that forces the reader to open the cover and read it through.

Good relations with the press should be fostered and coverage of aspects of research should be encouraged. There is not much point in allowing neophytes to write articles for the press on forestry matters when more harm than good may result through lack of sufficient knowledge of the topic. The Forestry Division should develop better public relations so that either it can provide digested information to the press or else assist outside writers to present articles that are more realistic and conform with the known facts.

Is there any reason why contact with the press and the publication of suitable literature should not be used to promote the idea that private industry can also play its part in financing research in the universities?

Encouragement of Research

> "Curiosity and love of science are the most important mental requirements of research. Perhaps the main incentive is the desire to win the esteem of one's associates, and the chief reward is the thrill of discovery, which is widely acclaimed as one of the greatest pleasures life has to offer.
> There is real gratification to be had from the pursuit of science, for its ideals can give purpose to life". (Beveridge, 1957).

To what extent are the above fostered here? I suggest that the "thrill of discovery" is one thing that is rather poorly nourished in our environment where the scientist and research worker is often thought of as an essentially useless type who has little relevance in the material age of commerce. The contrary is the case and this attitude must be dispelled. Given the right men with the right tools research will pay dividends, that is assuming that those in management and administration will listen to what he has to say. Unless he is heard and heeded the scientist would be better off not to exist. This is even more relevant in the case of applied research than in basic. Much of the latter is an end unto itself, but applied research is a service to the community, and to have the results of his work ignored because they do not fit the pre-conceived pattern, or because he has unpleasant things to say is, apart from an ostrich-like attitude, a horribly frustrating and degrading experience for the man involved.

Even in the United States, where research is on a far sounder footing and where it commands far greater respect than here there have been pleas for improvement. E. C. Stone (1958) in the concluding article of the dialogue on basic and applied research recommends the following:

1. Each Forestry School should re-examine the Ph.D. programme related to basic research.

2. Students should be encouraged to do research.

3. The U.S. Forest Service should limit the number of research stations and have each well equipped rather than a great number of poorly equipped ones.

4. The men trained for basic research and who will use the facilities should be allowed to plan the facilities and not the administrator who, for all his proven ability to deal with people and papers, may never have been an active participant in basic research.

5. Forestry Schools should improve their research facilities.

In the 4th point above the comments are most applicable to basic research, it is true, but they are also relevant to applied research. Perhaps a certain control, or rather guidance, should be given by the administrative section, but obviously the man who is doing the work knows best what he needs, and in this I say strongly that not only the chief research officer but also his colleagues, assistants and technicians should have a say in the development of facilities. Remember, without the technician not much would be accomplished.

It is not my place to talk on education, but for the development of a good research worker it is axiomatic that he receive his training in a place where research is fostered and respected.

Even for the man who is not inclined to research such an environment creates in him a respect for research. One cannot divorce education from the development of an active enquiring mind, and an active mind is best nurtured in an environment where scientific endeavour charges the atmosphere with inquisitiveness. The mind must be taught

> ". . . to realise that the concepts of to-day are not unchangeable but rather, are merely the best we have to-day; that all truth is progressive, not static". (Fletcher and McDermott, 1959).

I would like to transpose the suggestions of the above authors from their applicability to teachers to an applicability to research workers, i.e. that they be

(a) encouraged to conduct research or advanced study;
(b) provided with time and facilities for these activities;
(c) rewarded according to their competence and performance in either endeavour.

The encouragement, the facilities and the rewards are not enough in this country. In sustaining the research student (or worker!) Nearn (1959) also states these ideas by suggesting that he needs the following:

(a) Challenging and significant areas of work.
(b) The field populated with people whom he can respect.
(c) That if he becomes competent in his field he will be accepted by workers in other scientific fields as an equal,
(d) and that his material rewards will be at least sufficient to enable him to live in a manner which he is almost certain to desire because of his intellectual level.

The glorification of the salesman or business manager, etc., by the timber press, while belittling the researcher either turns him towards a more remunerative business side or else completely away and to a field where he will be respected.

Job interest and the need to feel wanted are essentials to any productive effort. Incorporated in these facets are respect and appreciation of the researcher's efforts by the administration, by the timber industry and by the public at large. The administration can contribute by fostering research and by heeding the words of researchers. The industry can, and should, contribute funds to research, and public respect can best be developed by a national appreciation of research, by more research-oriented university training and by good publicity. Most of the above become simplified with money. Total annual expenditure on research in the United States was, in 1959, about 1.3% of total *consumer expenditure,* whilst expenditure for forestry research amounted to 0.2% of *consumer expenditure* (Cowlin, 1959). Why is forestry always the poor cousin? The trend now is to increase expenditure on research in forestry,

with an aim towards achieving parity with that of other industries. One can realise that, where forestry is a remunerative business, the percentage of *investment* devoted to research will be considerably greater than the figures quoted, whereas in Ireland the situation occurs where expenditure exceeds income by a great degree. But we are building for the future and should think in terms of our prospective income. The Forestry Division's investment in research may compare reasonably well with American figures, but I feel our relative need for research and facilities is far greater than theirs; we have a long road to travel to catch up, both with the rapid expansion of the forestry programme and with the ever increasing needs so imposed to improve our forest production. Of course, I refer here to a percentage of that money devoted to direct forestry work. What about the total involvement of money in the produce of the forest? This is quite immense and this source has hardly been tapped. When all is said and done we are hardly giving forestry research the means to show its true worth.

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Society's Activities

Minutes of 23rd Annual General Meeting*

THE outgoing President, Mr. Swan, opening the proceedings asked that the Minutes of the 22nd Annual General Meeting, the Council's Report and the Abstracts of Account be taken as read. This was proposed and seconded by Mr. E. Johnston and Mr. H. Kerr. These three items were then placed before the meeting for discussion. The Society's financial position was discussed at length and members put forward a variety of suggestions to ease the situation. These dealt mainly with the Journal and increased membership. At present the sale of the journal to non-members is being subsidised by 4/- by each member. As the Journal now costs 10/- per copy to produce, those members who pay £1 subscription receive the other benefits of the Society gratis and even so the Journal is showing a loss of £100 per annum. An increase in price will not solve the problem as only aproximately 50 journals are sold to non-members. Reducing the cost per copy by increasing the number printed would be of little avail as our total membership does not exceed 400. A reduction in numbers printed would also have little benefit due to the size of our order. A number of lapsing members receive the 2 issues of any particular Journal free as they are not known until the end of the year. Any measure taken to combat this would be difficult to implement and might lead to a decrease in membership. In addition, the Constitution would be infringed by any such moves. A proposal that members be requested to susidise the journal during this difficult period was rejected due to administrative costs. The seeking of competitive tenders for printing and increasing the income from advertising appeared the most effective method of reducing the deficit.

The Vice-President then raised the question of the proposed book on forestry in Ireland to be published by the Society. However, lengthy discussion on costs was rather pointless when its final form had not as yet been decided. Nevertheless the book must be worthy of the Society, no effort being spared to see this achieved even to the extent of having it subsidised by members or an outside body. An efficient sales drive would achieve much as there were many markets available. The question of the material being out of date was raised and here it was pointed out that Mr. FitzPatrick appeared to be making every effort to rectify this matter. The delay in publishing was in no way due to any slackness on the part of the Editor as he had not received the contributions until last September. When finally edited the draft would be placed before a committee. Contributors would not have powers of veto but could express their views on the final form. There being no further discussion the Minutes, Council's Report and Abstracts of Accounts were declared passed.

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* Held at the Shelbourne Hotel, Dublin, March 20, 1965.

Presentation of Certificates:

The President then called on Messrs. Crowley and Collins to come forward and be the first successful candidates to sign the examination roll book. Both were warmly applauded by the assembly.

President's Address:

The outgoing President, Mr. Swan, read his valedictory address, reported later in this issue.

Confirmation of Election Results:

As his final duty the outgoing President placed the results of the 1965 Council elections and the following were duly confirmed as elected :—

President: Cecil S. Kilpatrick.
Vice-President: Owen V. Mooney.
Secretary: John O'Driscoll.
Treasurer: Thomas Moloney.
Editor: Leonard U. Gallagher.
Business Editor: J. Desmond Robinson.
Hon. Auditor: D. M. Craig.
Councillors Grade I: Dermot Mangan.
Charles H. Kerr.
Grade II: Martin O Neachtain.
Associate: Seamus Galvin.

The incoming President then took the Chair. He thanked the members for the honour they had bestowed on him in electing him President. He hoped that this would strengthen the bond of friendship and co-operation between foresters from North and South.

Motion:

The President opening the discussion on the motion "that the Society be reorganised on a regional basis" stated that the opinion of all members was sought on this very important matter. Following the recommendations of the meeting, the Council would discuss all view-points raised and would not rush into any hasty decisions. He then called on Mr. MacNamara to propose the motion. Mr. MacNamara stated that at present many members join for a year or two and then leave. The usual reason being that they live in areas remote from Society activities and so see no point in remaining on as members. This could be overcome by setting up local sub-committees in certain areas and these could then organise Society activities within their own regions. Each of these sub-committees would be composed of three technical members on whose shoulders would rest the onus of arranging the meetings whether indoor or outdoor, depending on the season.

The five day week should greatly assist in the working of this plan. The boundaries of the region would be those of the four provinces.

Mr. McEvoy, seconding the motion, reviewed the various aspects of the Society's activities and in addition asked if reorganisation was really necessary. On the question of membership, statistics quoted showed in all grades figures well below the potential. Each year at least 45 people are entering the forestry profession but despite this fact our membership remains static. Should persons of higher positions show an active part in Society affairs, membership might be expected to show an increase. In fact no effort should be spared to attract new members. If, as was sometimes stated, the Society was being run by a Dublin clique it was through necessity rather than design. More active participation of others might dispel this notion. With regard to meetings held in the provinces response was generally poor, while Sunday excursions have tended to degenerate into family outings. Some form of revitalisation is required either by having a definate theme with an expert to point out details or by reducing the number and improving the quality. In conclusion, Mr. McEvoy stated that what was required was less change in the constitution but rather within the constitution and suggested the formation of regional groups in Belfast, Galway, Cork, Dublin and one other East coast centre. Each group could arrange two meetings per year, one indoor and the other outdoor, with added responsibility of organising recruitment of new members within their area.

Members present at the meeting were then asked for their views on this vexed problem. These ranged from complete agreement on the reorganisation proposal to disagreement. Should reorganisation come to pass it would be essential to have representatives of each region on the Council where they could report on their activities. This raised the question of travelling expenses for such members. The location of the regions would depend greatly on the availability of suitable persons in the areas to act as local convenors. Following from this it might not be possible to form regions on a geographical basis. It was agreed, however, that the centres chosen should be equidistant from all points within tht region.

The President, in summarising, stated that from the views expressed it was clear that some form of reorganisation of the Society's activities was desirable. The size and form the regions should take was not clear but they should be equally accessible to all members within the area. He thanked the members for their views and stated that the council would take careful consideration of all that had been said before coming to any decision.

Programme for 1965:

The convenor, Miss Furlong, read the provisional excursion dates for 1965.

	LOCATION	LEADER
May ...	Shelton	Mr. Ua Cearbhaill
June ...	Annual Study Tour to Cavan ...	Mr. F. Molloy.
	Emo	Mr. N. O. Carroll.
July ...	Bansha	Mr. O. V. Mooney.
Sept. ...	Omagh	Dr. W. Jack.
Oct. ...	Blessington	Mr. D. Mangan.

There being no further business the President brought the meeting to a close, thanking all present for supporting the new time of 3 p.m. for the members' meeting.

J.O'D.

SOCIETY OF IRISH FORESTERS

Statement of Accounts for Year ended 31st December, 1964.

1963.	Income	£ s. d.	£ s. d.
£300 18 1	To **Balance from last account**		226 0 2
	,, **Subscriptions received:**		
	5 Technical Grade 1. 1962	5 0 0	
	11 ,, ,, ,, 1963	11 0 0	
	57 ,, ,, ,, 1964	85 10 0	
	4 ,, ,, ,, ,,	2 10 0	
	1 ,, ,, ,, 1965	1 10 0	
	1 ,, ,, ,, ,,	1 10 0	
	2 ,, ,, ,, 1966	2 0 0	
	1 ,, Grade 2. 1961	10 0	
	5 ,, ,, ,, 1962	2 10 0	
	17 ,, ,, ,, 1963	8 10 0	
	102 ,, ,, ,, 1964	102 0 0	
	1 ,, ,, ,, ,,	10 0	
	6 ,, ,, ,, 1965	6 0 0	
	3 Associate 1962	2 5 0	
	3 ,, 1963	2 5 0	
	85 ,, 1964	85 1 1	
	5 ,, ,,	2 5 0	
	2 ,, 1965	1 10 0	
£237 5 0			322 6 1
£6 16 8	,, **Interest on Investments**		6 16 8
£308 6 4	,, **Journals sold and Advertisements**		296 16 5
—	,, **Examination Fees:**		
	Woodman's Certificate	4 0 0	
	Forester's Certificate	6 0 0	
			10 0 0
£11 2 0	,, Badges sold		—
£864 8 1			£861 19 4

1963.	Expenditure	£ s. d.	£ s. d.
£116 8 1	By **Stationery and Printing** ...		90 6 8
£302 4 0	,, **Printing of Journal and reprints of Articles**		400 19 9
£72 7 5	,, **Postages**		65 0 3
£32 19 0	,, **Expenses re Meetings** ...		74 16 9
£2 4 0	,, **Bank Charges & Cheque Book**		1 7 3
£12 10 0	,, **Honorariums:** Secretary	12 10 0	
£12 10 0	,, Treasurer	12 10 0	
£20 0 0	,, Editor	20 0 0	
			45 0 0
3 1 0	,, **Trees for Ireland**—Affiliation fee		2 0 0
—	,, **Study Tour**		25 0 0
—	,, **Examination Expenses** ...		22 8 3
£42 2 5	,, **Deficit on 21st Anniversary Dinner**		—
£22 2 0	,, **Entertainment of French Foresters**		—
£226 0 2	,, **Balance in Bank**		135 0 5
£864 8 1			£861 19 4

I have examined the above account compared it with the books and vouchers and certify it to be correct, the balance to credit being £135 0s. 5d. which is on current account at the Ulster Bank Ltd. There is also a holding of £200 Dublin Corporation 5% Redeemable Stock 1962/73 and a holding of £200 Prize Bonds. Credit has not been taken for Subscriptions for 1963 £23 and for 1964 £126 5s. 0d. which were outstanding at 31st December, 1964.

29th January, 1965.

D. M. CRAIG, Hon. Auditor,
85 Harcourt Street, Dublin, 2.

President's Valedictory Address [1]

By M. Swan [2]

FORESTS must now rank among the major resources of the world. They cover about one-third of the world's land surface but because of man's exploitation they are in shortest supply in the regions of greatest population, where, of course, they are most needed. The question then arises, should man spend a greater proportion of his time, money and land in recreating the forest in his immediate vicinity or should he rely on imports from forests, whose boundaries are ever receding from him. To answer this question he must make a decision, will his resources be more gainfully employed in recreating and developing the forest than in the alternative productive work available to him. He tackles the problem by trying to weigh his costs of establishment, development and harvesting against his estimated returns and by this means establishes a comparison on which he can make his choice. For most industries these calculations are relatively straightforward, the time factor is short and the costs and returns relatively clear cut and definite. But what is the picture for forestry like? To the man with money to invest it is fairly straightforward, he invests so much money and he wants a return on that money. True, his calculations are somewhat more difficult, he has to predict his returns in terms of real values 40 to 50 years hence but he is thinking in terms of timber or cellulose only and on this basis the answer seldom favours forestry.

But is this the correct answer, or rather is the question properly posed? If we look at the world in general we begin to realise the havoc caused by the indiscriminate exploitation and removal of the forest. In America, in India and nearer home in Greece and Italy we hear of disastrous floods, dust bowls and erosion, with consequent loss of agricultural crops, with increased poverty and hunger.

Obviously there is more to forestry than is included in the economist's calculations or the Faustmann formula. What other advantages are conferred by the forest which are left out of the cold profit and loss calculations, apart from the tangible returns of timber or cellulose, which measure the productivity of the site? Forests build up soil and protect it from erosion; they help to control flooding by the interception of the falling rain and by keeping the soil porous by the myriads of channels formed by decaying roots. Forests conserve and purify municipal and industrial water supplies, and they prevent the silting of reservoirs. They harbour and protect a great number of animals and fungi useful to man; they break the force of winds and provide shelter for man, beast and crops. Lastly they provide man with a place where

[1] Delivered at the Annual General Meeting of the Society at the Shelbourne Hotel, Dublin, Saturday, March 20, 1965.

[2] Outgoing President for the year 1964.

he can relax in peace, contentment and tranquility from the cares and worries of his work.

Who would care to transfer these benefits into terms of money; but without them the case for forestry is only partially stated. Let us face it, however, if we want an individual to invest his money in any venture we must be able to offer him a good return in money for his investment. The truth is that the individual is not interested in benefiting his neighbours and so only governments and municipal or local authorities, who consider the general good and well-being of the community and not of the individual, are interested in the ancillary benefits of forestry and can accept them in full in considering their investment. Forestry is for the nation rather than for the individual. In few places in the world to-day does forestry exist without government sponsorship and laws to protect and perpetuate the forest and it is an unfortunate fact that no nation has taken effective steps to conserve its forest wealth until it faced, or thought it faced, the consequences of scarcity.

Forestry is really for the nation and in making the case for a national forest policy we must think in terms beyond the narrow concept of economic rotations, or financial maturity, or timber or forest valuation. We must also think and plan in terms of timber processing and the forests' ancillary values of water control and conservation, of the promotion of wild life, of recreation, of erosion prevention and the many other benefits.

What are the prospects if a country decides to embark on a forest programme aimed at developing an export in timber? What is the future pattern of demand for timber in Europe likely to be? We know that the gross demand for timber is rising each year but the form in which it is required is changing and the greatest increase is in pulp and woodbased panel products. F.A.O. have estimated that by 1975 more than half of all the industrial wood consumed in Europe will be used in these forms. The demand for sawntimber is also rising but to a lesser extent and at a much slower rate, while the demand for wood to be used in the round is falling fast.

The fall in the demand for timber in the round is easy to understand. Much of it was used as fuel for light, heating and power. Nowadays electricity from many sources has replaced it for power; and domestic heating and cooking have turned to gas and oil. The position with sawntimber is not so easy to explain. It is, of course, inevitable that competition from substitutes will be keenly felt in this field. Also in this age of mass production the need for a standard product can be appreciated. Unfortunately, timber is not by any means uniform or standard and unless simple and easily applied grading rules can be devised sawntimber will continue to give way to substitutes. Perhaps some of the difficulty also arises from the fact that the sawmilling industry comprises a very large number of small units with no overall central control and this places it at a disadvantage by comparison with

its bigger and more concentrated competitors, particularly in the fields of research and co-ordination of supplies and marketing.

What of the future European supply position? Over the first half of the century requirements of industrial wood rose very slowly and because of the decline in the use of fuel wood removals also rose but little. The beginning of the second half of the century, however, has shown a sharp and spectacular rise in requirements and it is estimated that by 1975 Europe's consumption of industrial wood will have doubled the 1950 figure and more than half of consumption will be as pulp products and wood-based panel products.

How is this increase to be met? In the past, European management practices have aimed at achieving a large reserve of standing timber supporting a sustained even annual cut. Now with the emphasis on economics the tendency is to support the same cut or increment on a smaller growing stock and so show a higher increment per cent. But the gross increment is still the same and there is a danger that we may be lulled into the false security of believing we have increased increment.

The increase will have to come from improved techniques, improved strains of trees by selection and breeding, improved management by a more particular and precise attention to every step in the establishment, growth and harvesting of our timber crops and possibly from an increased area under forest.

European forests are for the most part confined to poor soils in remote areas, not easy of access and often with inclement weather. Modern techniques of fertilising and soil improvement and modern transport can yield increases here. Possibly the greatest increase, however, can be expected from the changing pattern of utilization. Size and quality no longer command the premium they did and the emphasis is now more on quantity than quality. Pulp and reconstituted wood industries can now accept small sized timber and much that was formerly waste can now be marketed and used. The fall in fuel-wood demand will allow much to be directed to these industries as well. Advances in research have resulted in an increased use of short-fibred timber in pulp industries and this has enabled a larger proportion of hardwoods to be used, which will also help to relieve the position. Also important is a more detailed and precise knowledge of increment, age distribution and species which would allow of full use of available increment, and advances in aerial-survey and assessment will help considerably here.

However, there is a limit to what can be achieved by these means, mainly because of costs. Forest operations are labour intensive and the work itself is hard and demanding; it is outdoor work which must be carried on in all kinds of weather and so young workers are not attracted to it. The forest has traditionally provided out of season employment for agricultural labour but with the exodus from the rural areas the labour force is disappearing and mechanisation cannot give the attention required to ensure maximum yield. The result is that

there is a limit to what may be achieved in increasing yields from existing forests. The question is, will it be enough, and the answer seems to be no, it will not.

Supplies from overseas will undoubtedly play an increasing part in the future and the general lowering of European tariff barriers is going to make these imports very competitive. Also we can expect that in countries in which timber is in short supply there will be a change from the present use of available material to other more productive uses. In this respect the sawmilling industry may expect to feel the pinch first, as it is at a considerable disadvantage to the pulp and wood based panel industries whose processing increases the value of the product many fold. Also in these latter industries the raw material makes up a smaller share of the gross costs of production and so a rise in timber prices can be more easily absorbed. Therefore, in any competition for limited supplies the sawmilling industry can expect to lose ground to the pulp and wood panel product industries and to substitutes.

A country entering the European timber market is likely to find that the greatest demand will be from the pulp and wood-based panel products industries and since timber is bulky to transport she will probably find it more economical and profitable to do part of the processing at home herself. There will always be a demand for high quality veneer timbers but she will probably find that in the larger timber sizes the competition from topical forests will be severe, too severe. In between will be the sawntimber, yielding only a modest return on investment and facing the competition from substitutes.

To sum up, it would seem that, in the immediate future, Europe's soft-wood requirements will grow faster than removals from her forests can be expected to supply under present management plans, possibly faster than can be achieved within the present framework of growing and harvesting timber. Europe will be able to meet her requirements in medium and low grade hardwood timber : with this can be expected a tendency for sawn hardwood to replace sawn softwood and for pulp and wood-based panel product industries to capture an increasing share of the limited softwoods available.

Beyond 1975 what the position will be is very difficult to guess. The rate of growth in timber requirements should be slowing down but the gross demand will still be enormous. However, it is as well to remember that because of research and technological developments it is expected that some 15 million acres of agricultural land will have become surplus to the needs of agricultural crops. How will this land be used—for greater agricultural production for export or for timber to meet the Continent's own needs? Should it go to forestry, and in all probability it will, production will be high and only similarly productive lands can hope to compete.

Day Excursion to Shelton Abbey

MAY 2nd, 1965.

THE Society's first field day of 1965 took place on 2nd May at Shelton Forest Nursery. In spite of the poor weather there was a satisfactory turn out of members but proceedings were confined by rain to a visit to the experimental greenhouse set up by the Research Branch of the Forestry Division.

After the usual opening formalities Mr. Mooney introduced the topic for discussion with a brief summary on the contorta pine provenance research programme with particular reference to the search for provenances suitable to Irish conditions.

Mr. O'Driscoll elaborated on the subject and described the greenhouse and its objects.

Tree improvement first started in 1961 when contorta pine plus trees were selected by members of the Research Branch, British Forestry Commission and a representative from the Danish Forest Service. These were located as follows : East coast — 32, South — 28, West — 4.

In 1962 scions were sent to Scotland and Denmark to form the basis of their seed orchards. Grafting commenced in Spring 1963 in the open but due to adverse weather conditions and unsuitable stocks the results were poor.

Following the poor results the erection of a glass house was considered necessary. The glass house is 20 feet wide by 70 feet long and has a capacity for approximately 2,000 grafts. The present work commenced in the spring of 1964 when 2,000 stocks were potted in a specially prepared mixture of sand, loam and peat. These were embedded in a gravel bed and allowed develop throughout the summer. In December they were moved into the green house. Here they were subject to soil heat of 45°F. for 3 weeks and 60°F. for 2 weeks.

The scion collection was undertaken when first growth of buds was noticed after some 4 weeks heat. 40 trees were chosen to form the basis of the first seed orchard and 40 scions were collected from these. Of the remaining 22 trees, two blew down so that 20 scions were grafted. They will form the basis of a tree bank ensuring the preservation of these trees.

The method of collecton involved the use of a shot-gun with heavy cartridges. As the scions were collected they were sent to the Research Nursery at Shelton and grafted immediately using side veneer method. In all 1,850 scions were grafted. Success has been 100% to date with some clones. Cutting back of stock has been undertaken but it is intended to leave one branch until next year. Lining out will take place in the summer and it is hoped to set up the orchard in 1966 at Avondale.

	Loam	Peat	Sand		
Potting mixture	7	3	2	+	¼ oz. John Innes Base Fert. per pot.
Bedding mixture	1	: 1	peat and sand		

Watered 2 weekly.

Growth best in middle 2 beds due to possibly better insulation from outside influences.

Questions from members followed which were answered in detail by Mr. Mooney and Mr. O'Driscoll.

When the meeting finished the President, Mr. C. Kilpatrick on behalf of the Society thanked the contributors and expressed his appreciation to the Minister for Lands for facilities offered and to Mr. Ua Cearbhaill and the staff at Shelton School for their kind co-operation.

G.J.G.

Annual Study Tour

IN THE CAVAN DISTRICT FROM JUNE 1st TO JUNE 3rd

First Day (Tuesday, June 1st).

The sun shone, in its now almost traditional benevolence, as our bus moved away from the Farnham Arms Hotel in Cavan to our first stop at Castlesanderson Property of Belturbert Forest. There the President welcomed the tour to Ulster and thanked the tour leader, Mr. Fergal Mulloy and the convenor, Miss Lily Furlong for their assiduous preparations. Mr. Haughey, the forester, was then introduced and his assistant, Mr. Hoban, and the pleasure of the Minister of Lands was expressed.

Mr. Mulloy then lead us to our first stop in Compartment 20, carrying Norway spruce, P/38. With a top height of 55 feet and a basal area of 142 H.ft.^{2} it had a volume of 3,825 H.ft.^{3} Reference to the brochure given to us gave a ready comparison with Quality Class I B.F.C., and with a new concept, a B.F.C. Yield Class 240. As most of us were being hit with this new yardstick for the first time, it gave rise to much discussion and Mr. Gerhardt Gallagher was busied with questions from all sides. Yield Class 240, he explained, meant a production of 240 H. ft.^{3} per acre per year and such a figure became a management definition of production. The thinning regime was calculated to a finely adjusted level of basal area. This regime derived from the economics of marginality, whereby the lowest capital was employed to give the maximum return of interest. Such tables use top height for deriving production potential, but not

for purposes of definition. It was felt that greater refinement of the tables was to be expected as they were at present rather broad in their class descriptions. Discussion of them was most interesting, and it was refreshing to feel a vital interest developing in the definition of economic standards of production.

Mr. McNamara called attention to some clean-boled ash of 9″ q.g. and Mr. Mulloy referred to their growing on soils of Silurian derivation. This was believed to give ash free from calcium tyloses and leave the ash more supple for its final use in sports goods. Reference was also made to the evidence of natural ash being more frost hardy than planted ash.

Our second stop was made on land granted under the Ulster Plantation Compt. 19 Castlesanderson. Oak groups which had been planted in 1938 in a Norway spruce matrix had been steadily eclipsed, so that to-day one wondered was there sufficient oak to carry it through a second rotation of spruce. It was thought that this was just possible but the question reopened the perennial topic of hardwood inclusion with conifers. Many embers of memory were stirred and various opinions set forth. All agreed on the utter need of early intervention, but the degree of attention was reduced if the groups were protected by their own size and close planting.

In moving from this stop, Mr. McEvoy remarked on the pronounced spiral grain evident in some of the spruce. The Breton foresters had been surprised to see that we in Ireland did nothing to reduce the incidence of it. Such timber would be inferior for sawing and the removal of any spiral grain stems in early thinnings was recommended.

Our third stop was on the property of Major Madden, Hilton Park, Clones, who cordially welcomed us. He told us of some background history of the estate and it was obvious that his family's association with the estate over many generations was a keen source of pride for him.

The lands were granted to a Sir William Forth in 1622 after the dispossession of the McMahon clan. Then in 1734 a Dr. Madden, who was a doctor of divinity and was later to be associated with the founding of the Royal Dublin Society, purchased the area. He marked the event of his marriage and of taking up residence there in 1751 by planting an oak tree. Several generations of the family had since cherished and enriched their heritage which includes 200 acres of woods and plantations of the total estate of 906 acres. Of this acreage, there are over 90 of conifers, mostly Sitka spruce. In latter years the production of Christmas trees by the close planting of Norway spruce with hardwood, has become important.

Chemical grass cleaning was employed and it allowed full feathering of the trees to ground level. The application of 'Gramoxone' from two sides by using an 'Arbogard' was proving both effective and economic. The results on a line planting of Norway spruce at 2½ ft.

spacing with beech and occasional oak in alternating single lines was encouraging. No formal protection against deer or hare had been necessary and the unfenced planting on a steep rise from the main drive served to enhance the parkland beauty.

An area of poplar, of *robusta* and *eugenii* species, and planted in 1957 to fill a blown area, was then visited. The *robusta,* approaching 25 feet tall and pruned when reaching $2\frac{1}{2}$" q.g., was surely of the best in the country. It was situated in an area of lush nettle growth and a pH of 6.7 but the water table was almost at ground level. Some later planting was sheltered by other plantations and served to show by the straighter stems why Ireland can be regarded as the windiest country in Europe. Major Madden was interested in hearing views on pruning. He felt that pruning in June avoided epicormic growth while pruning in February allowed callouses to heal quickly. He intends to prune to 20 feet but match manufacturers wish trees to be pruned a further 10 feet which makes pruning disproportionately expensive.

The regeneration of an area carrying old beech and *Abies alba* was then visited. The sparse regeneration shown made the rehabilitation essential. The felling of all inferior hardwoods, leaving only amenity specimens and the planting of any blanks using *Abies grandis*

Mr. O. V. Mooney, comments: "I don't think there is any doubt about that."

was recommended. The use of agricultural land to produce Christmas trees was being practised at the following stop. At 3 × 2½ ft. on a 6 year rotation, cleaning by using 'Arbogard' and 4 fluid ozs. of 'Gramoxone' per gallon of water was employed. One man cleaned an acre in two days at a total cost of £12. The use of 'Preglone', 'Dowpon' and 'Gramoxone' in nursery, Christmas tree and general forestry were discussed and the comparative costs of using such as T.V.O. were considered. Specific areas were best considered individually, it was felt, and using sprays under precise conditions was of great importance.

The final pause at Major Madden's occasioned a pleasant rivalry when we each guessed the height of a fine Douglas-fir of 32 inches q.g. Mr. Mangan, with a sharp eye for such things no doubt, won the prize presented by Mrs. Madden with a guess of 140 ft., beating Mr. Hanan's guess only by a whisker!

After a gratifying lunch at the White Horse Hotel, Cootehill, the next stop was made in Cootehill Forest. Mr. Leonard, forester in charge, led us to Compt. 38, Dartry, on drumlin soil where Scots pine had been severely thinned, leaving only 100 cubic ft. per acre and the area had been replanted using Douglas-fir and Norway spruce. The Scots had been of suspect provenance and had been disappointing. Mr. Condon put a case for total clearance to allow ploughing which would have been worthwhile at even 1 acre per day output. Professor Clear felt that, given satisfactory growth, choice Scots of say 16″ q.g. at 80 years would result from the present policy which he recommened despite a resultant risk of pine shoot beetle and moth infestation. The total clearance of lop and top at a cost of £20 per acre had reduced this risk and this was considered reasonable.

A pleasant journey of some miles through the sunlit drumlin country of Cavan then brought us to famed Dunaree in Kingscourt Forest. Under wonderful conditions Mr. P. Cassidy and his assistant Mr. John Duane showed us the results of Forestry Division's first decided essay into recreational promotion. Mr. Duane's enthusiasm showed in a tasteful layout of walks and vista points culminating in the renowned wishing well. And to round out the visit, as we rested in the green glade by the famed chestnut tree Mr. Duane treated us to a warm rendition of the delightful song.

J.D.

Second Day (Wednesday, June 2nd).

The sun again shone brilliantly on this second day of the tour as we studied the forests of south Cavan, taking in the northern tips of counties Longford, Westmeath and Meath.

At the first stop, in Camagh Property of Castlepollard Forest, Mr. Mulloy pointed out that the week was devoted to three main site types: *1.* 'Leitrim Daubs', *2.* better old woodland sites and *3.* cut-over bogs. This first stop was on a cut-over bog now consisting of about 30 inches of good amorphous peat over a limestone sub-stratum. The nearby

River Inny drainage scheme appears to be improving the bog. The tree-crop was three year old Sitka spruce under which *Molinia* was taking over from *Calluna* to a large extent, but it was felt that the heather will come back and cause check in the Sitka spruce in about three years time. This check appears to be tied up with a toxic substance in the heather roots, rather than mere root competition, and Mr. N. O'Carroll cited an experiment on a Midland peat where response of Sitka spruce following chemical suppression of heather was evident, whereas application of phosphates without heather suppression had no appreciable effect. 'Gramoxone' spray before planting followed by the calculated risk of getting the Sitka spruce through the frost-danger period was Mr. Maher's recipe for success.

A short distance away, on the same bog, Mr. Mulloy showed us an area of seven year old *Pinus contorta* which is comprised of two strongly contrasting forms. One was the now famous (or infamous!) Lulu Island provenance, recognised by its profuse male flowering and distinctly 'Interior' fine-foliaged appearance, while the other was called 'Oak Ridge' provenance. This latter provenance is an 'Interior' type but with noticeably thick needles, comes from an area about 160 miles inland in the Cascade Mountains, and is also lacking in vigour. Mr. T. McEvoy was not convinced that there was not a place for Lulu Island

Messrs. G. J. Gallagher, D. McGlynn, S. Galvin and T. McEvoy in profound thought.

Pinus contorta in Irish forestry, such as in the Midland bogs, but Mr. O'Carroll had no faith in it, even here, working on evidence so far collected from a variety of other sites. Mr. O'Carroll did, however, suggest that it might have a place in horticulture as a handsome suburban decorative, especially in the spring when the orange-brown male flowers are so abundant ! At this point Professor Clear suggested not only chemical suppression of the heather and the use of Sitka spruce but, perhaps, a whole revolution in plant espacement such as 12 × 3 feet to allow for easier mechanical spraying, extraction, etc. In spite of fairly stiff opposition, he maintained that high quality timber would result and that there would be no difficulty in mutual suppression of branches.

In driving to the next stop at Mullaghmeen we were interested to see several of the new bungalow-type Land Commission houses in County Westmeath. These would appear to be a complete and welcome breakaway from the older cottage-type similar to the average County Council houses.

At Mullaghmeen we inspected a stand of 29 year old beech which had originally been planted with European larch, but most of the latter had since been removed. A lively discussion developed as to the merits of pruning but Professor Clear was of the opinion that there was no great price differential between grades of beech. He advocated leaving the dominant trees alone so that they would produce the bulk and at the same time would become self-pruned. He maintained further that beech is mainly for the furniture trade and therefore four foot bolts are all that are required. It was generally agreed that if one cannot shape hardwoods by secateur-pruning in the first five years no later pruning is of value and, furthermore, an acre should be the minimum block of hardwood. Major Madden was more optimistic about the economics of hardwood growing and even about firewood sales since the introduction of the chain saw to almost every farm.

In Compartments 6 and 7 one of the almost inexplicable mysteries of forestry was demonstrated in the form of small areas of a variety of P/57 conifers which were all in a state of check. The soil is shallow over limestone and it was suggested that the presence of *Aira caespitosa* indicated a high water table which was combining with local frost-hollows to create the almost stagnant condition of the tree-crop. However, perseverance with *Abies procera* looked the best course of action, in spite of the fair showing of Corsican pine. Scots pine and European larch are almost total failures on this site.

On the way back to the bus we passed over the shoulder of a small hill and from about 800 feet had a magnificent view across what is sometimes described as the "dull flat Midlands." From a vantage point of this sort the lakes, bogs and farm-land were anything but dull, seen under perfect weather conditions. Following lunch which was eaten in the very pleasant surroundings of the Park Hotel, Virginia a short

walk beside the golf course brought us to part of Headford Property of Baileboro Forest. Here the demonstration was on the effect of wind on a 27 year old Norway spruce crop following the removal of a belt of old hardwoods to windward. In this general context Mr. Gallagher thought it might be worthwhile to dig a series of survey soil-pits which would enable one to think ahead of anticipatory fellings. In this particular case it was felt that it might have been wiser to leave the hardwoods as a lakeside amenity belt but occasional small windblows create an uneven-aged forest which in itself is an amenity.

The last stop of the day, in Compartment 6, provoked one of the liveliest discussions of the tour. Here we saw beech and oak 27 years old which had been thinned early and was now inclined to spread. In a survey of the 5½ acres involved about 80 trees per acre, of all species, were found and of these a lot might be considered doubtful and of course they were not evenly spaced. As beech and oak are not mutually compatible it should have been decided long ago to keep the oak. By topping the beech early, clean oak should have resulted and the small shrubby beech would keep the ground and the oak stems clean. Alternatively at this stage, it was suggested that it might be possible to ring-bark the beech at 8 feet either mechanically or chemically. One suggestion for ring-barking was simply to beat all around the stem with a hammer and peel off the strip. Professor Clear finished the discussion on the optimistic note that it should be possible to grow oak to a quality worth £3 per cu. ft.

A.M.S.H.

Third Day (Thursday, June 3rd).

On the third day of the tour, under blue skies and a blazing sun tempered by a westerly breeze, the members were privileged to study under such ideal conditions the two extremes of the productive capacity of forest soils in the Cavan area. On the one hand there were the deep free-draining brown-earths of Killeshandra where production lies close to the maximum. On the other hand, at the other end of the productive scale, were the gleys or 'channel' soils of Swanlinbar, where impeded drainage and low fertility are the most significant and critical characteristics. By way of contrast, but completely pertinent to the problems of afforestation in impeded drainage areas, a visit was made to the Agricultural Institute Research Station at Ballinamore to observe and discuss the activities in the agricultural field on this type.

The first call on this most instructive day was to Castlehamilton Property of Killeshandra Forest. At the outset the President introduced Mr. M. Ryan, a soils expert from the Agricultural Institute who had just joined the party that morning. He intimated that Mr. Ryan's presence on that day was propitious and felt that his contributions in the soils field would be significant and of tremendous value and benefit to the members. So indeed it proved to be as the day unfolded. Mr. Mulloy then introduced the Forester-in-charge, Mr. B. Collins, and his assistant, Mr. M. Friel. He then briefly recounted the history of Castle-

hamilton Property. The Property was established in the period 1934-38 with Sitka spruce and Norway spruce as the main species. Resultant crops are of Quality Class I and II standards (Yield-Class 240-280). This rather striking production level gave rise to a spirited discussion on a method of thinning to be adopted to ensure maximum output from these categories. Mr. Gallagher explained the significance of the new Y-Class concept of production control. Comparisons were drawn between Yield Table and Y-Class figures and their respective relevance to the actual crop figures presented. Various reasons were put forward by Messrs. McEvoy, Breslin, Maher and Condon for the disparity which was apparent in particular elements of the statistics. Messrs. McGlynn and Mooney felt that the heavy grade of thinning adopted was, however, appropriate to the site conditions. This view in fact represented the general concensus of opinion of the party. Professor Clear elaborated at this point on the concept of thinning to marginality. This concept envisages a thinning practice being adopted which is strictly related to the productive and incremental capacity of the crop. Appropriate cubic footage is removed at appropriate intervals having regard to management and marketing plans.

At the next halt, in Compartment 10, (Norway spruce with some oak) the perennial question of what procedure to adopt in regard to the oak came under discussion. Mr. Kilpatrick advocated that where the hardwood element did not have sufficient stems per acre to form a final crop that it should be written off and ignored in management plans for the area. Both Mr. McEvoy and Mr. Maher disagreed and suggested that even small amounts of hardwoods should be encouraged and even cherished in management plans. In the party generally there was more support for the latter point of view, but this would seem to be based on sentiment rather than hard facts of forest management practice.

At a subsequent halt Mr. Ryan commented on the excellent soil conditions prevailing in Castlehamilton generally. He described it as a deep free-draining brown-earth on the border of the Silurian and the Limestone, which was fairly typical of that region of Co. Cavan. This gave rise to a discussion on the relative merits of forestry as against agriculture on these soils. On the basis of his knowledge of the farming practice of the region Mr. Ryan estimated that gross agricultural production would amount to £50 per acre. A rapid calculation of forestry potential provided a figure of £25 per acre. This sobering statistic imparted a jolt to those of us who had been observing with a somewhat smug satisfaction the excellent results from forestry on these soils. It was noted that Mr. Mulloy fortwith became conscious of the time and set the party in motion toward the next site!

In Compartment 12, the very vexed question of the incidence of *Fomes annosus* on Sitka spruce was raised by Mr. Doyle. He wondered (in common perhaps with many others) at the efficacy of the stump treatment with creosote. Mr. McGlynn intimated that while the creosote treatment did not eradicate the disease from the soil, it certainly had an

inhibiting effect on its extension to other as yet unaffected stems, nevertheless he felt that a good deal more investigation was necessary on this particular problem. Mr. O'Carroll referred to the work of Danish investigators and Dr. Jack referred to that of the British Forestry Commission. Neither investigation was, however, as yet conclusive. Professor Clear, Mr. Mangan and Mr. Mulloy also contributed to the discussion.

The next property visited was at Gortinaul where Sitka and Norway spruce crops of P/34 vintage were studied. Here Mr. C. H. Kerr invited observation on the method of marking thinnings for standing sales, and Mr. Mulloy elaborated on the system employed. Mr. G. Gallagher commented on the comparision between Yield Table figures, Y-Class figures and the actual C/D grade of thinning adopted in this plot. In commenting on an observation regarding the apparent change in volume production on adjoining areas of this plot, Mr. Collins pointed to the close relationships between such changes and the invasion of briars into the ground vegetation. Mr. McEvoy intimated that this would seem to arise from variable soil depths due to the undulating nature of the particular compartment. At this point Mr. Condon drew attention to the fact that selected stems in this Sitka spruce stand were high-pruned. He questioned the economic justification of this practice in a fast-growing conifer which would inevitably, due to its rapid growth, lack some of the essential qualities of "quality" timber, the avowed objective of high-pruning. Mr. J. Durand expressed a measure of agreement because the end uses of Sitka spruce did not require the high standards of quality aimed at. Further support for the view expressed was not, however, forthcoming, and in fact the suggestion was "shot down" from all angles! Professor Clear intimated that high-increment stands always justify high-pruning. Rings per inch was not regarded as a critical requirement for quality. Uniformity of ring-growth and freedom from knots were far more critical requirements. Mr. Mulloy referred to the bad reputation of Irish timber in the past and suggested that all fast-growing timbers must be high-pruned. Mr. McNamara referred to the possibilities of high-quality, knot-free timber and Sitka spruce in particular in the peeling or veneer trade. (e.g. Sitka spruce for chip baskets.). -In the face of such weighty opposition Mr. Condon did not pursue the point further and the discussion was concluded by Mr. McGlynn who outlined the specifications adopted by the Forestry Division to ensure a uniform and guaranteed standard of high-pruning practice.

At this stage a pre-prandial lethargy had overtaken most of the party but this was very quickly and effectively dispelled by an excellent picnic-lunch partaken of in the beautiful surroundings of Killykeen Property. The President very appropriately drew attention to the wonderful possibilities of tourist development in this part of Cavan generally and in Killykeen in particular. The members of the party would unanimously agree with the sentiments expressed.

Following lunch the party proceeded to Swanlinbar Forest (Burren Property). Here our acquaintance was renewed with Mr. Haughey and Mr. Hoban, whom we had already met on our first day at Castlesanderson. The problems studied at Burren were in complete contrast to those encountered in the forenoon and indeed to those encountered generally up to then on our tour of the Cavan area. Here the situation was characterised by extreme conditions of impeded drainage coupled with inherently low fertility. Sitka spruce (P/62) and lodgepole pine, Norway spruce and noble fir (P/63) were studied *in situ*. Mr. Ryan described the properties and features of the soil type. Discussion ensued on what was deemed the best method of establishment to be adopted in such circumstances. It was generally agreed that treatment with Clarke plough would probably give the best results. Prompted by a query from Mr. S. Galvin on the subject, Dr. R. J. McConnen elaborated on the comparative economics of short rotation forest crops on low production sites against reclamation to agriculture for grass production. He pointed out however, that such comparisons were only valid in certain circumstances and in practice might never arise.

The next and final feature of this third day was a visit to the Agricultural Institute Research Station at Ballinamore. Mr. Mulqueen welcomed the party on behalf of the Director. He outlined the work being carried on at the Station the object of which was to investigate management problems associated with the traditional farming methods of the area. The aim was to evolve new techniques by which the stocking rates on farms could be increased and maintained. The party was then taken on a conducted tour of the farm where various trials designed to investigate drainage, physical condition of soil, nutrient status and stock management, were observed and discussed. A very interesting sidelight on this visit was provided by Mrs. McCracken in her observations on the local history of the Ballinamore/Swanlinbar area and the activities that characterised the area in the 17th and 18th centuries. The visit was very appropriately brought to a close by the party being entertained to tea by the Agricultural Institute. This was an excellent repast and was much appreciated by all. This concluded the technical activities of the 1965 Study Tour.

L.C.

Day Excursion to Emo Forest

JUNE 20th, 1965

Despite delightful weather and an elaborately prepared and most instructive day the attendance at this excursion was very poor, a total of 15 members being present.

Mr. N. O'Carroll, leader, brought the party to Moanvane (trans.: Fair Meadow) Property where three sites were visited, the emphasis being on research into nutrient deficiencies on this bog type. The

site was a reedswamp peat which Mr. T. Barry stated would never have been covered by raised-type bog. The land had been drained and used for agriculture (mainly hay production) before being acquired for forestry. Planting took place between 1942 and 1944 using Norway spruce (*Pica abies*) and Scots pine (*Pinus sylvestris*). Growth was never good and this was particularly evident in the spruce. As a consequence, the Research Branch of the Forestry Division was called in to investigate the problem in 1961.

Stop 1 :

Here Mr. O'Carroll described the site as being an extremely dry peat on which deep cracks, up to two feet, had developed due to drainage after planting and a major drainage scheme in the area. He described to us the development of research in the area. The first investigations centred on evaluating the effect of drainage on the growth of the trees. No relationship was found to exist between height growth and distance of trees from the nearest drain, nor was any relationship found between height growth, and moisture content of the peat. Relationship between water table and height growth was also investigated, with similarly negative results.

Foliar analysis for N, P, K, Ca and Mg were then carried cut, a nutrient deficiency being suspected. Whereas the level of the other elements showed no pattern a strong positive relationship between height growth and foliar K was found to exist. The manurial experiment, laid down in spring 1964, had the following treatments :—

3 cwts. potassium sulphate per acre.
6 cwts. potassium sulphate per acre.
Control.

So far the effect has been to give a strong herbal response in the ground vegetation and a definite colour response in the trees. No improvement in growth had yet occurred. Dead trees in the area had been debilitated by K deficiency and killed by frost. To this Mr. L. Gallagher commented that increased salt concentration in the tissues would, by depressing freezing point, reduce the likelihood of frost injury and that workers in America had found increased frost resistance after application of potassium.

Stop 2 :

This area constituted the best plot and was of Q.C. I Norway spruce, which was not included in the experiment. This excellent growth could not be attributed to any visible factors of site and discussion, while raising the question of N/K interaction, was inconclusive. It was explained at this point that pot-trials at Shelton Abbey were initiated to test if a relationship existed between the level of K in the soil and the soil-moisture content; different water

régimes were established and half of the pots in each condition were treated with K.

Stop 3 :

Two Norway spruce trees stood side by side, the first had vigorous green foliage and maintained good growth, the second had sparse, chlorotic foliage and growth was poor — why ? This was not meant as a rhetorical question but, in any event, discussion presented no answer !

In thanking the Minister for Lands and the organisers of the excursion the President expressed his appreciation of revealing, at an early stage, the progress and results of the work of the Research Branch, and he hoped that this would continue.

L.U.G.

Day Excursion to Bansha Forest

JULY 11th, 1965

The Society's outing to Bansha Forest was fortunate in having fine weather. A good turn out of members was present when Mr. Munnelly, District Inspector, welcomed the party on behalf of the Minister for Lands, and introduced the Forester-in-Charge, Mr. Doyle.

Before the excursion proper started, Mr. Mooney called on all members present to vote on a proposal made by the Council of the Society that Mr. David Stewart be elected an Honorary Member of the Society. As Mr. Stewart was more familiar to those members living in Northern Ireland, Mr. Mooney gave a short account of what he had achieved in a long life devoted to forestry, both in the Republic, in his earlier years, and in the North up to his retirement. Afterwards, being put to a vote, the proposal was carried unanimously.

After Mr. Munnelly had outlined the history of the forest, we moved on to the first point of interest in a heavily thinned plot of *Pinus contorta,* which had been laid out by the Research Branch. Mr. Mooney explained the background.

This plot was related to correlated curve trend thinning/spacing experiments which had been established in P.C. to investigate growth trends at different stocking levels. The plot we were looking at had originally a P.C./S.P. mixture but the Scots pine developed poorly, or had died out leaving widely spaced P.C. in a condition approaching free growth. As a first step in preparing the plot all the S.P. was removed. The P.C. was then thinned heavily. In all 44% of the basal area was removed from the original crop to free the crowns from competition. On a stems-per-acre basis the

thinning intensity was E Grade, according to British Forestry Commission definition.

The objects of the experiment were twofold; firstly, to maintain the plot under open grown condition so as to relate its growth to experiments where a wide range of competition conditions was envisaged but in which some early competition had occurred; secondly, to maintain it as a permanent sample plot in addition to the other permanent sample plots laid down in the species to add to records of growth, height, girth, basal area and volume, and information on taper, crown and bark.

VOLUME OF PLOT

Basal area	Mean B/A	Mean ht.	Mean volume	No. of trees	Area
24.83 sq. ft.	0.282 sq. ft.		4.81 cu. ft.		(acres)
19.49 H. ft.^{2}	0.221 H. ft.^{2}	38 ft.	3.78 H. ft.^{3}	88	0.2

Total volume: 423.28 cu. ft.
332.28 H. ft.^{3}

Vol. per acre: 2089 cu. ft.
1640 H. ft.^{3}

VOLUME OF PLOT AT FIRST MEASUREMENT

December 1963
336.16 cu. ft.
263.89 H. ft.^{3}

Vol. per acre: 1681 cu. ft.
1320 H. ft.^{3}

Thinnings: 1087 cu. ft.
853 H. ft.^{3}

Total volume prior to thinning: 2768 cu. ft.
2173 H. ft.^{3}

The party then moved on to plots where various manurial treatments were being tried on retarded P.C. of Lulu Island origin, planted in 1941. Mr. Mooney explained that the trials were to test the response of the P.C. to applications of nitrogen, phosphate, potash and copper. It had been estimated, he told us, that some 60 to 80,000 acres of Lulu Island contorta pine had been planted and it had not been showing great promise. The object was to find out whether these crops could be brought into some kind of better production by fertilising. He told us that it was, as yet, too early to make positive staements but the indications were that the application of phosphate alone seemed to be giving the best result. Mr. N. O'Carroll went on to tell us how the experiments were designed in order to test all factors and combinations with the minimum number of plots.

After we had seen these trials Mr. Mooney explained and showed

examples of the different provenances of Interior, Coastal and Lulu Island contorta.

To complete the tour, Mr. Munnelly showed us a small block of 36 years old Sitka spruce that was marked for clear felling. He asked us did we consider that the crop should be felled at this stage. He gave, as the basis of their decision, that the crop had been suffering from severe defoliation by *Aphis* over a number of years and that growth had all but stopped. It was agreed that the site was too dry for Sitka spruce and that this probably contributed mostly to the trouble and, therefore, the only solution was to fell.

After the usual excellent tea a vote of thanks was given and the excursion was brought to a close.

M.J.S.

Weekend Excursion to Counties Omagh and Fermanagh

SEPTEMBER 11th AND 12th, 1965

The visit of the Society to the forests of Northern Ireland was planned for the weekend of the Northern Ireland Forestry Competitions so that the members could spend the Saturday at the competitions and have a full day on the Sunday to visit the forests of the region.

NORTHERN IRELAND FORESTRY COMPETITIONS 1965

The 1965 Forestry Competitions were held on Saturday, 11th September, in the beautiful setting of Gortin Glen Forest in Co. Tyrone. Although not very old, the oldest plantations being less than 30 years planted, this forest has already achieved a delightful sylvan atmosphere and it is likely that in the very near future it will become a Forest Park with specific facilities being provided for public recreation and enjoyment. The weather could perhaps be described as fairly typical Irish mist but this did not dampen the spirits of the almost 500 spectators.

The McGregor Cup and prizes for the various Felling and Cross-Cutting Competitions were presented by His Grace the Duke of Abercorn who is well known for his interest in land use, the countryside and forestry in particular. This interest has led him to travel all over the world and he has been honoured by being chosen as current President of the Royal Forestry Society of England, Wales and Northern Ireland. The Macmahon Shield and prizes for fire fighting were presented by Divisional Officer J. Morrison, of the Northern Ireland Fire Authority who have always strongly supported and assisted with this competition. The date was also a suitable occasion for the presentation by Mr. W. H. Elliott,

Senior Assistant Secretary, Ministry of Agriculture, of the Challenge Bowl for the best individual garden to the joint winners, Messrs. Barr of Muckamore Forest Nursery, South Antrim District, and Deane of Castle Archdale Forest, West Fermanagh District, and of the Shield for the best housing site in Northern Ireland to Somerset Forest, North Antrim District. Medals awarded to Forestry Division drivers under the National Safe Driving Competition organised by the Royal Society for the Prevention of Accidents were also presented by the local Northern Ireland Organiser of the Society, Mr. L. Sinfield.

One event which gave very considerable pleasure to all forestry personnel in Northern Ireland was the award by the Society of Irish Foresters of Honorary Membership to Mr. D. Stewart, I.S.O., making him the sole present Honorary Member of the Society. The roll of Honorary Members was presented for Mr. Stewart's signature by the current President, Mr. C. S. Kilpatrick, Deputy Chief Forest Officer, Northern Ireland Forestry Division, and Vice-President, Mr. O. V. Mooney, Chief Research Officer of the Forestry Division of the Department of Lands. Formerly with the Department of Agriculture and Technical Instruction, Mr. Stewart, a Scotsman, became a Forestry Commission Officer and then Senior Forestry Officer in the Northern Ireland Ministry for Agriculture until his retirement in 1950. During retirement he has kept in close contact with forestry matters and has been a very welcome visitor and judge at the forestry competitions. We all wish him well and many more happy years of retirement.

The Trophy for the main Tree Felling Competition, the McGregor Cup, was won with 88½ per cent. of total marks by E. Laird of Baronscourt Forest, Co. Tyrone, who was also winner in 1962. Great credit is due to him as he is now a Foreman yet he has retained sufficient skill to beat some very strong opposition from forest workers. Shortly after the main event Eddie went on with his partner, William Stevenson, to become close runner-up to the Monaghan brothers, also of Baronscourt Forest, in the Cross-Cutting Competition. In the incredibly short time of 44 seconds the brothers cut three discs from the ends of three logs, each approximately 10 ins. in diameter, using a hand cross-cut saw.

Joint runners-up in the Tree Felling Competition were F. Gilliland of Knockmany Forest, East Fermanagh District — winner on two previous occasions — and E. Monaghan of Castlecaldwell Forest, West Fermanagh District, another familiar face at the finals, who also took third place in the current year's Axe Felling Competition.

The Axe Felling Competition was won by J. J. Mullan of Gortnamoyagh Forest, North Derry District, with a total time of 1 minute 2 seconds, while only a few seconds behind was P. J. Duffy of Pomeroy Forestry School.

Chain saw felling and cross cutting was won in 1 minute 7 seconds by John Creen of Newcastle Forest, County Down District, with Albert McKenna of Favour Royal Forest, East Fermanagh District, only 7 seconds slower. The prize for the best maintained chain and guide bar went to J. J. McGuigan of Baronscourt Forest.

The fire fighting team was from Roslea Forest, East Fermanagh District, with Ballypatrick Forest, North Antrim, and Gortin Glen Forest, the home team, very close behind. The Divisional Fire Officer had some very complimentary remarks to make about the overall standard of all competitors.

The success of this great social occasion was largely due to the meticulous organisation and hard work put into it by many members of the Northern Ireland Forestry Division staff and, in particular, those from West Tyrone District under Mr. W. G. Dallas, District Forest Officer.

W. H. J.

ELY LODGE FOREST

In the morning the members travelled from Omagh to Ely Lodge Forest, Co. Fermanagh, where Mr. J. C. L. Phillips brought the party on a conducted tour through the forest in which areas are being developed to promote their tourist potential. A nature trail was being planned which should be quite an attraction, if the one at Tollymore Park is anything to judge by. The trail would point out areas of typical lake-side vegetation and patterns of disturbed vegetation, amongst other features.

Alhough some members appeared to experience a certain amount of difficulty in locating the view point overlooking Lough Erne, which was also being developed as an amentity, a most rewarding view of the lake was enjoyed by the party before heading on to Garrison for luncheon.

LOUGH NAVAR FOREST

In the afternoon the party visited Lough Navar Forest to see manurial experiments on deep peat. The leader was Dr. W. H. Jack, Research Officer, accompanied by Mr. Montgomery, Head Forester, and Mr. Fitzpatrick, the Forester in Charge.

The first experiment was designed to give information on the mineral and fertiliser requirements of trees on deep peat. Four treatments were applied to the site in 1957, four years before planting, the treatments being :—

1. Conrol.
2. 2 tons ground limestone per acre.
3. 10 cwts. slag per acre.
4. 2 tons ground limestone and 10 cwts. slag per acre.

The area was planted in 1961 when one half of each plot was given an additional dose of 2 oz. slag per plant.

Leader growth was measured in August last and a comparison of the last two years leader growth is :—

Treatment	Leader Growth (inches) 1964	1965
Nil	0.3	0.3
Nil + 2 ozs. slag	6.3	9.1
2 tons ground limestone	3.0	2.9
2 tons ground limestone + 2 ozs. slag	7.6	7.0
10 cwts. slag	13.6	14.1
10 cwts. slag + 2 ozs. slag	7.0	10.8
2 tons ground limestone + 10 cwts. slag	9.0	11.3
2 tons ground limestone + 10 cwts. slag + 2 ozs. slag	8.8	10.1

The disappointing results where no slag was applied were noted. Mr. Maher referred to the Old Red Sandstone areas at Ballyhoura, Co. Cork, where, he said, that without phosphate no amount of manuring had any effect. Side effects of the heavy manurial dressing was the occurrence of lamas growth and also a tendency to broken and double leaders.

Dr. Jack pointed out that one object of manuring in advance of planting was to get rid of the heather. This had not been fully successful although the 10 cwt. slag dressing had altered the vegetation considerably. On the question of how long before planting you should manure he said that there was no answer as yet. In the present case manuring had taken place four years before planting but in Ballypatrick Forest they had cases of manuring two years and six years before planting and both were doing well. He added that it has now become standard practice in Northern Ireland to broadcast 4 cwt. ground rock phosphate per acre before ploughing and he reminded the party that the phosphate content of the rock phosphate was double that of slag. Mr. Kilpatrick suggested that, as the manuring did not fully control the heather, and until further information was available, it might be best to manure the year before planting and control the heather by chemical spray.

The second experiment, established in 1961, was designed to test the effects and interactions of N, P and K. The manures used were :—

Nitro-chalk at levels of	0	1 cwt.	2 cwt./acre
Superphosphate at levels of	0	3 ,,	6 ,, ,,
Muriate of potash	0	$\frac{3}{4}$,,	$1\frac{1}{2}$,, ,,

and there were 27 treatments.

Results to date indicated that without phosphate there was little or no growth. In the early stages potash was important but in the current leader growth this effect had disappeared. The effect

of nitrogen was negligible as it gave no real colour change or measurable growth. The discussion which followed centred mainly on the question of nitrogen and it was suggested that as the form of nitrogen used was very slow acting it might be desirable to try the highly soluble nitrate instead. It was also suggested that clover might be tried, but Mr. Parkin pointed out that to maintain clover you must add phosphate. It was noted that the superphosphate at 6 cwts. per acre gave the best leader growth in 1965 and that in the plot with this level of phosphate the height of the hundred largest trees was over five feet, which was considered a satisfactory rate of growth for this poor peat.

The third experiment was to compare the effects of slag, ground rock phosphate and Semsol all at the one level of 2 cwts. per acre, and had been established in 1959. Leader growth assessments for 1964 and 1965 were :—

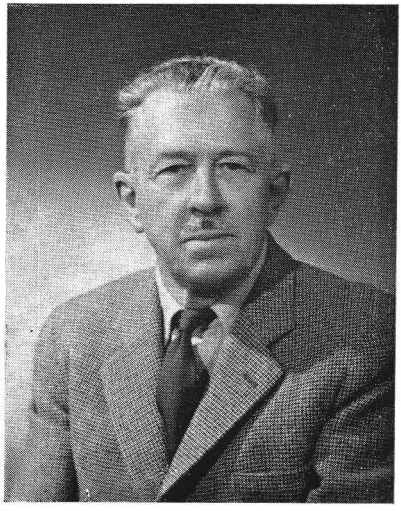
	Leader Growth (inches)	
Treatment	1964	1965
Control	0.8	0.8
2 cwts. slag per acre	7.7	5.3
2 cwts. GMP per acre	9.7	8.1
2 cwts. Semsol per acre	9.4	7.9

Dr. Jack pointed out that there was a general falling off in growth in 1965 relative to 1964 although growth during both years was better than had been apparent in 1963 except for the plots which had received slag. Again there had been an apparently greater reduction in growth on slag plots than with the other phosphate manures. This falling off from 1964 to 1965 may, he said, have been due to some extent to a general climatic or other cause but this did not appear, from general observation elsewhere, to be particularly likely and he suggested a better explanation might be that the amount of phosphate has been insufficient to maintain growth and that the falling off was a nutrient deficiency. Reference to other experiments in Lough Navar forest where heavier doses of phosphate had been given showed that on the younger crop the 1965 growth has generally exceeded the 1964 growth.

The President thanked Dr. Jack and the local foresters for their contributions to the success of the excursion and expressed the Society's gratitude to the Minister for Agriculture for the facilities made available. On dispersing the cavalcade drove through majestic terrain which, in the evening light, made an excellent finale to the weekend.

M.S.

Obituary



MEMBERS of the Society will have heard with deep regret of the death of Dr. Herbert Francis Mooney, C.I.E., C.B.E., E.D., M.A., SC.D., F.L.S. which took place suddenly on the 20th August 1964 at his home in Killiney. May he rest in peace.

After a most varied and distinguished career in the Indian Forest Service and the British Middle East Office, he retired in 1962, devoting his abundant energies to planning and planting a large garden, yachting in Dublin Bay, golf and social work. He also found time to take an active interest in our Society, reading a very interesting paper on "The Vegetation of Ethiopia", and attending several of our field events where his technical contributions and his ability as a raconteur were equally appreciated.

Born in Dublin in 1898, he received his education at Belvedere College and Clongowes Wood before taking up medicine at Trinity College. His studies were interrupted by the First World War when he served in India with the Indian Cavalry. After a forestry course at Oxford he joined the Indian Forest Service in 1921 and retired as Conservator of Forests in 1947. He worked especially in Bihar and Orissa and was noted for the excellent relations which he established with the Indians. He achieved exceptional success in dealing with such intractable forest problems as "shifting cultivation". No doubt his genuine anxiety to improve the living conditions of the population was recognised and this, together with his outstanding personality, was the key to his success.

After his Indian service he joined the British Middle East Office with headquarters in Beirut and paid forestry advisory visits to Iran, Iraq, Syria, the Lebanon, Israel and the Sudan. Later he moved to Addis Ababa where he was advisor on forestry to the Emperor of Ethiopia and became his personal friend.

Apart from his professional and administrative work, he earned a reputation as a botanist and ecologist, publishing a "Supplement to the Botany of Bihar and Orissa" and enriching the Herbaria at Kew and Addis Ababa. Trinity recognised his scientific achievements by conferring on him the degree of Sc.D. in November, 1945.

Notice

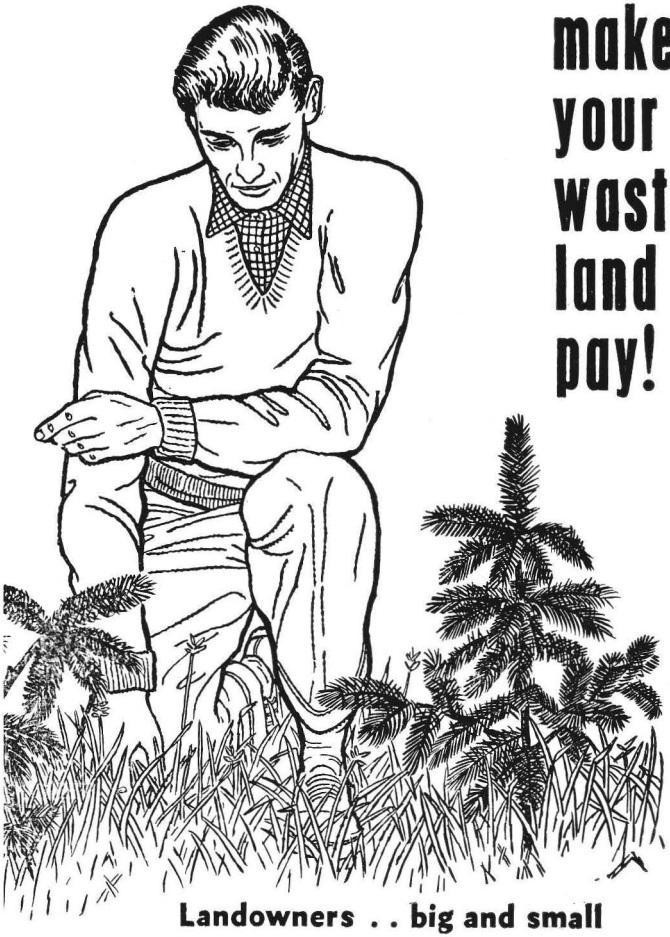
The Society wishes to draw the attention of members resident in Northern Ireland to the fact that the Commissioners of Inland Revenue have approved the Society of Irish Foresters for the purposes of tax deduction.

Commencing with the year to April 5th, 1966, a member from Northern Ireland who is assessable to income tax under Schedule E is entitled to a deduction from emoluments of office or employment of the whole of the annual subscription, provided that:—

(a) the subscription is defrayed out of the emoluments of the office or employment, and,

(b) the activities of the society are relevant to the office or employment (*e.g.* advancement or spreading of knowledge, maintenance of standards of conduct and competence), that is to say, the performance of duties of the office or employment is directly affected by the knowledge concerned or involves the exercise of the profession concerned.

A member who is entitled to relief should apply to his tax office for form P358 on which to make a claim for the relief due to him.



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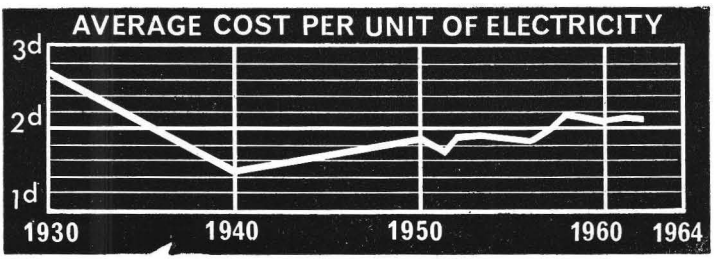

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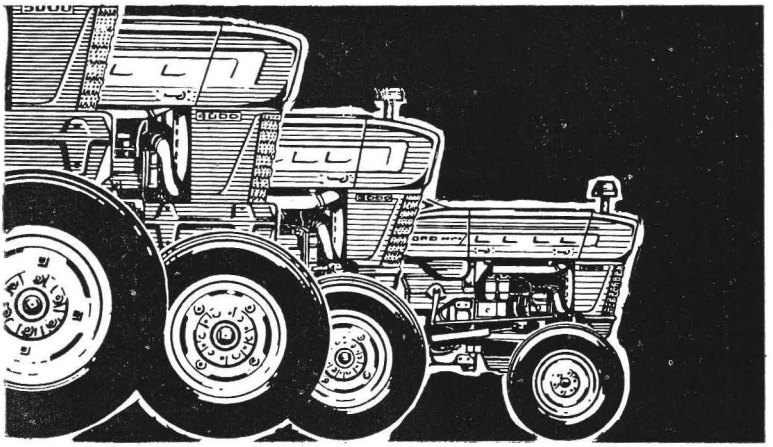

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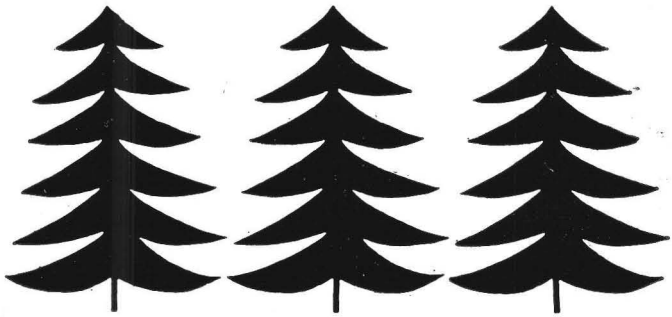

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