

NISBET'S OBSERVATIONS ON IRISH FORESTRY IN YEAR 1904

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Introductory.

Some interesting information on the condition of the woods existing in this country at the beginning of the present century, on forestry practice then in force, and on recommendations for future schemes of work—are to be found in Dr. Nisbet's "Report on the Woods, Plantations and Wastelands in the South Eastern Counties of Ireland," which was addressed to the Department of Agriculture in 1904. Dr. John Nisbet was, at this time, regarded as one of the ablest exponents of scientific forestry in Britain and in the space of his career had held various important forestry appointments. Born in 1853, he was educated in Edinburgh and studied forestry for some time at Munich where he was a pupil of Gayer. He passed into the Indian Forest Service in 1875, retiring in 1900 after reaching the rank of Conservator. Little is known of his work in India which is merged in the merit of the Service; it was by his continual endeavour on his return to the United Kingdom, to awaken the Government to its responsibilities regarding the growing timber consumption and the need for ensuring an adequate supply of home-grown timber that he was mainly recognised, and it is realised now that much of what has already been done is due in great measure to his efforts. He is probably best known to foresters by reason of his publications, which include among others "British Forest Trees," "The Forester; a Practical Treatise on British Forestry and Arboriculture" and "The Elements of British Forestry."

In 1903, Nisbet made an advisory tour of the woods and waste grounds in Counties Wicklow, Wexford, Carlow, Kilkenny and Waterford at the request of the Department of Agriculture, and his general report and proposals for large-scale afforestation in Ireland by the State have been largely followed in actual practice. His inspection notes on many of the stands visited throw some light on condition and quality of much of the woodland being cleared or thinned at the present time, but it is apparent that he had very little time to spend in each wood and his methods of stating dimensions of trees and rates of growth often do not give a very clear picture of the wood, while insufficient attention appears to have been paid to the aspect and altitude of stands upon which rate of growth and quality of trees depend very much in a small island country. At this time, there had been little division of the old estates and forestry work on these properties was of a somewhat haphazard nature, depending principally on the protection of game and on ornament and to a lesser extent on the supply of pit-wood for the English and Welsh collieries and for estate and local requirements.

General Statistics.

In 1902, the Agricultural Statistics, Ireland, showed the extent of woodland in the five counties visited to be 17,644 acres in Wicklow, 9,785 acres in Wexford, 3,046 acres in Carlow, 9,995 acres in Kilkenny and 19,749 acres in Waterford, making a total of 60,219 acres. The proportion per cent. of woodland to other land under the above was respectively 3.5, 1.6, 1.4, 2.0 and 4.4, Waterford and Wicklow containing by far the largest percentages of woods and plantations to be found in any county in Ireland. The percentage for the whole country was 1.5, the smallest for all European countries, so that Ireland could be regarded as the worst wooded country in the world. Nisbet stresses that one very great disadvantage of this want of woodlands was the absence of shelter from cold and strong winds in a country where stock raising in the open field was the main branch of agriculture.

That the south-eastern part of the country was at one time much more heavily wooded, there is no doubt, but in the fifty years previous to Nisbet's tour there was very little change in the total area, statistics showing a figure of 304,906 acres for the whole country in 1851 as compared with 303,023 acres in 1902. Woodland reached its maximum area in 1880, after the great famine, with 339,858 acres, but with the passing of the Land Act of 1881 very little additional planting was done and large

clearances took place from then onwards. According to the returns for the whole country, the figure of 303,023 acres in 1902 was estimated to consist of 45,033 acres under larch, 32,998 acres under fir, 14,976 acres under spruce, 2,494 acres under pine, 26,611 acres under oak, 6,987 acres under ash, 10,095 acres under beech, 2,519 acres under sycamore, 2,709 acres under elm, 4,702 acres under other trees and 153,899 acres under mixed crops. Oak was the principal tree in demesne woods and woods of an ornamental character and larch was the chief tree in woods intended to be worked for profit. It will be interesting to compare these figures with those arrived at in the recent census of woods carried out by the Forestry Department.

Classification of the Woods.

From his inspection of the various woods, Nisbet put them into the following five classes:—

A. *Remains of the original woods and old plantations.*

1. Demesne woods and ornamental plantations usually in the form of belts near residences.
2. Old oak copse woods or coppice under standards, formerly worked for timber.
3. Old oak coppices formerly worked for bark and now either interplanted with conifers, or forming scrub with a mixture of self-sown birch, willow, rowan, etc.

B. *Plantations formed since the great famine of 1846-47.*

4. Plantations chiefly coniferous, intended for game protection or shelter.
5. Coniferous plantations formed on poor land mainly with a view to profit.

Of the first class little need be said. They were mainly of an ornamental character, but the majority of them contained extremely fine specimens of both broad-leaved and coniferous trees which give the lie to the assertion that timber trees will not grow as well in the climate of Ireland as in that of the Continent of Europe.

The second class formed at one time a large proportion of the woodland, but by the beginning of the present century they were of very limited extent. They were confined to the larger estates and were worked principally for ship-building timber. The management of coppice with regular age classes of standard is now a lost art in this country, and with the fall in the value of the underwood, it is never likely to be recovered. Roddenagh Wood, near Aughrim, is mentioned as having been one of the finest of these woods.

Classes two and three form the chief remnants of the old oak woods with which Ireland must at one time have been greatly covered, class two being confined to the better land and class three to the more exposed and shallow soil areas. These coppice woods were often the most valuable part of landed estates, but with the decline of the bark industry they were no longer subject to any regular system of management. Landowners either cleared them and allowed them to develop from coppice shoots to high forest or in many cases inter-planted them with larch, possibly to act as a nurse for the oak shoots, but more probably because of the commercial value of this conifer. Conditions for larch were generally ideal on these sites, and many fine crops of this timber were cut during the twenty years previous to Nisbet's visit. By this time, the oak woods thus treated were already mature, but not of great size, and numerous borings showed a very slow rate of growth. The treatment advised for these woods is very much the practice which is being followed to-day—a gradual replacement with conifers—as it was foreseen that there would be very little demand for oak of this size and that such woods would be very unremunerative in their present form. The advent of two world wars has considerably disproved this forecast.

Class four calls for no comment, but it is of interest to note that as regards shelter belts, coniferous trees were not favoured by Nisbet for this purpose, but if these are preferred, he recommended Mountain Pine, Spruce, Silver Fir or Douglas Fir. Present-day observations do not confirm the suitability of these species, with the possible exception

of Silver Fir and any species of Spruce makes a most unsatisfactory shelter belt in any type of ground.

Of the last class, which is the most important from the forester's point of view, it was estimated that such woods formed only one-fifth to one-quarter of the total woodland area, and on very few estates was any regular system of management adopted in their treatment. Owners, agents and foresters had no knowledge of areas, costs of working or revenues from the woods and planting and felling were generally of a sporadic and haphazard nature.

Over-thinning.

Nisbet's chief complaint concerning the woods in Class five was that they were all subjected to "premature and unnecessarily heavy thinning," and this led him to discuss the matter of thinning comprehensively. Modern foresters would not agree with much of what he says, particularly as regards larch, the principal tree in these woods; his main object was to keep the crop dense for a long period, removing only dead, dying, diseased and blown trees, and it is common experience now that in the majority of privately owned mature and semi-mature larch woods proper development of the trees had been hindered by too long a delay in making the early thinnings. No doubt many of these woods were cut into too heavily in places to improve their usefulness as cover for game and for ornamental effect, but Nisbet's German training had apparently influenced his ideas too far in the other direction.

Management at Gurteen.

Early saleable thinnings and short rotations were obviously best suited to the private owner who was anxious to have as quick a return as possible from his investment, and an example of this type of working is given for the De la Poer property at Gurteen. The data per acre are as follows for larch grown for the pitwood market:—

1st thinning at about 15 years of age, yields about 580 trees=20 tons	
2nd thinning at about 20 years of age, yields about 500 trees=25 tons	
3rd thinning at about 27 years of age, yields about 380 trees=20 tons	
4th thinning at about 30 years of age, yields about 360 trees=30 tons	
5th final clearance 35 years of age, yields about 240 trees=20 tons	
Total per acre	2,060 „ =115 tons

The prices obtainable for the timber sold standing and measured down to 3" top diameter, over bark, were 10/- to 12/- per ton for larch and 5/- to 5/6 for Scots Pine. The cost of replanting at 4' x 4' averaged from £2 10/- to £4 15/- per acre—use of wire netting on the fence being unnecessary.

Instead of the heavy thinning adopted under this system Nisbet recommended clear felling an area of wood each time to give an equivalent number of poles, followed by immediate replanting, but there is no reason why, on suitable sites, pitwood timber and large commercial timber should not be obtained from the same stand when managed on a proper system. It was suggested, however, that the burden of growing timber of large size on long rotations was not one to place on the private landowner, but was obviously the obligation of the State, and Nisbet considered that satisfactory timber could well be grown here if Continental forestry practice were applied. A certain amount of broad-leaved trees would always be grown in the vicinity of country houses for their beauty, but softwoods being in greatest demand, would form the bulk of the forests.

Condition of Coniferous Woods.

For the unsatisfactory conditions of the existing coniferous woods, Nisbet attributed the following reasons:

1. Owners and their foresters had no opportunity of acquiring any knowledge of forestry, except of a rough rule-of-thumb kind.
2. Even such knowledge of practical forestry as obtained among these men was not acted upon, first considerations being given to game preservation and ornament.
3. Lack of adjacent wood-consuming industries, poor prices for tim-

ber and the need for plantations to be convenient to a sea port to be at all remunerative.

4. The above three reasons had induced premature and heavy thinning, leaving the older stands very thin and generally devoid of larch which was the most readily saleable species.

5. In consequence of 4, yield per acre was smaller and the timber of poorer quality. Damage from windfall also became much more frequent.

6. Again as a result of 4, the woods were forced into prematurity, larch completing its main growth in the south-east of Ireland from 35 to 40 years of age. It was found in the majority of woods visited that, although this was the case, there was no reason why larch, if given close canopy and grown on suitable sites, should not be treated on a rotation of 60 to 70 years. Some of the finest larch timber seen in the United Kingdom was from a 70-years-old stand at Castlebernard, portion of which was blown in the great gale of 1903.

7 Larch, being the tree most easily sold and commanding the best price, was planted on all sites, inducing frequent attacks of the canker disease. This disease was found to be principally confined to plantations formed between 1870 and 1881, the worst cases noted being at Cuckoo Island, Birr, and at Castle Boro, Co. Wexford. There was comparatively little damage in Co. Wicklow where larch was chiefly planted through Oak and Scots Pine. Pine plantations frequently showed attacks of *Peridermium pini*, the worst cases noted being at Shillelagh, Co. Wicklow, and Cappagh, Co. Waterford, and squirrel damage was prevalent in nearly all plantations. Rabbits appear to have been as plentiful as they are to-day.

Douglas Fir.

This tree was regarded as the most important timber tree introduced into Europe in the nineteenth century, and the Pacific or dark-green variety was considered as being a very suitable forest tree for Ireland in the event of the Government undertaking large-scale afforestation. Its rate of growth was calculated to be greater than larch and its timber to be superior to that of Scots Pine, commanding a price half-way between those of larch and Scots pine. Reference was made to the small Douglas fir plantation planted in 1885 at Whalley Abbey. It was originally a mixture of Douglas fir and Thuya, planted at 6' by 6', the Thuya being completely suppressed at an early age and in 1904 the fir was about 50 to 60 feet in height with an average girth of 27 inches at breast height. The fact that the lower branches still persisted, although dead, caused Nisbet to recommend planting at 4' by 4' or 4½' by 4½', but it is apparent now, when extensive plantations of Douglas fir have been established, possibly on the recommendation already made in this paragraph, that artificial pruning is necessary no matter what the planting distance. Pure plantations of this species were recommended.

Plantable Wastelands.

In 1885 Dr. Schlich estimated that 2,000,000 acres of the waste lands of the whole of Ireland, north and south, could be made available for planting, but this figure is judged to be very much in excess of what could be planted with any reasonable hope of profit. Exposure is so severe that vast stretches of land, otherwise suitable, could not produce marketable timber at a profit even allowing for a considerable rise in the market value of timber in out of the way places. In the counties visited by Nisbet, he came to the conclusion that approximately one-fifth only of the lands classified as waste land could profitably be planted, so great were the deductions to be made for turf bog of too great a depth, for very exposed ground above the 1,000 foot contour and for land occupied by water, roads and fences. Applying the ratio of one-fifth to the whole of Ireland would give a figure of 755,928 acres. The cost of planting such an area, including draining and fencing, over a period of 50 to 60 years was estimated to cost four and half to five million pounds disregarding interest and exclusive of the cost of acquiring the land and maintaining the woods and plantations. In addition there was endless scope for shelter belts all over the country and strong recommendations were made to replace those cut over and to increase the existing number for the benefit of farmers.

Samples of Costs and Revenues.

Various calculations were made to show the probable profits likely to be obtained from plantations of different types, but space does not allow quoting these in a short article, nor did Nisbet place much faith in these statistical calculations. More useful is his account of several stands for which some figures of costs and income were available.

Ballyreagh Wood, near Enniskerry, is one such stand, particulars of which are as follows:—Area, 1,100 statute acres, ground steep, aspect north-east, elevation 500 to 800 feet, loose soil over a granite rock. Planting was done about 1870, species principally pine and larch, with a small amount of Spruce, Silver fir and Douglas fir. Planting was by T. notching, costing 12/6 per acre; plants used 9 to 15 inches high, put in at 4-foot spacing. Cost of planting including drainage and erection of the boundary wall was about £4 per acre. Beating up was done for the following three or four years. In 1904 this wood showed 372 trees per acre, 250 larch and 122 Scots pine, but over-thinning was evident. Average height 58 feet. Squirrel damage was serious on the pine. Considerable sums had been taken from the sale of thinnings and it was estimated that the standing crop remaining was worth £40 to £50 per acre.

Garryduff Wood, Rathdrum, another example, was a wood of 473 acres with all aspects represented and reaching a height of 925 feet above sea level. Planting was done from 1845 to 1849, chiefly with Larch and Scots Pine and a little Spruce on the moist ground. There was no record of the cost of planting which was by the pitting method at a distance of 3½' by 3½' and 4' by 4'. From the age of 20 years tangible returns in the way of thinnings and windfalls produced about £620, expenditure on cleaning, thinning and maintenance amounting to £599. In 1903 a clear felling over 60 acres, 291 trees per acre, realised £3,050 and the quality of the Larch was stated to be excellent. At this time, the Larch girthed 28 to 40 inches and the Pine 30 to 38 inches at breast height and the crop was very thin, with large bracken-covered gaps, but was estimated to be worth £60 per acre standing. Damage from squirrels and bark beetles was evident, but there was very little trace of canker.

General National Economic Point of View.

The effects of large-scale planting were stated generally:—

1. To equalise atmospheric and soil temperature and to diminish extreme differences.
 2. To increase the relative humidity of the air and probably to a slight extent, the rainfall.
 3. To store up moisture in the soil, reducing flooding and providing for the perennial flow of rivers, streams and springs.
 4. To prevent erosion.
 5. To provide employment.
- and with special reference to Ireland
- i. To increase trade and industry generally.
 - ii. To provide home-grown supplies of timber.
 - iii. To provide shelter from wind, desirable in a stock-raising country.
 - iv. To increase facilities for sport and the amenities of the countryside.

The type of land which it was recommended should receive first attention was the furze and bracken-covered ground which prior to the famine had been either under cultivation or satisfactory grazing, and large tracts of this type were available. They are very suitable for mixed conifers, the land generally being loamy and naturally well drained. The cut-away parts of peat bogs, too, are very often plantable but there is seldom any very extensive area of such and very expensive drainage is generally necessary. Deep peat bogs and high barren ground are not worth attention. No mention is made of cut-away woods or extensive areas of uneconomic scrub, and it would appear that these should obviously have first preference and would be naturally most suitable in a scheme of re-afforestation.

Considerable space is devoted to the system which should be adopted in planting large tracts of land, and this generally applies to-day, but the principle of raising artificial shelter-belts before the main blocks are planted is a point to which a good deal of attention is given and one generally completely neglected at the present time, chiefly on account of the administrative and supervisory difficulties which would arise. Mention is made of the difficulties likely to be encountered in acquiring large blocks of land, of the reasons why it is not in the power of land-owners to plant extensively and of the Government's obligation to undertake large afforestation schemes.

Proposed Organisation of a Forestry Department.

In the event of the Government undertaking to afforest land on a large scale, Nisbet proposed that a Forestry Branch should be formed in the Department of Agriculture and that the head of such Forestry Branch should be responsible for the entire work of that Branch. Such technical officer would be *ex-officio*, one of the new trustees to be appointed under Section 20 (1) of the Irish Land Act, 1903. In addition to this Departmental officer, two trustees should be appointed in an honorary capacity in each county where land was acquired, and it was suggested that one of these should be a leading landowner nominated by the Department of Agriculture and the other some person resident within the county, nominated by the Rural or District Council, and approved by the Department of Agriculture. These men, having special and intimate local knowledge, would be able to give valuable advice and would co-operate with the Departmental officer who would be responsible for all technical matters and for the best utilisation of the funds at disposal under the budget. Some idea would thus be obtained of the type of land which could be acquired in each county, and upon the data collected for the first year or two schemes of work and extent and sites of nurseries could be arranged. With the expansion of the work, one assistant forest officer would be required for each province, a forest ranger for each county where sufficient land had been acquired, and a trained forester to take charge of each forest unit. It was observed that 2,000 acres of woods should be the maximum area under the charge of a forester, under the most favourable conditions. Much greater areas are single charges at the present time and also much smaller areas, and it is not considered desirable to allocate a charge according to area. Its extent will depend upon the age and condition of the plantations, upon the intensity of working and upon the type of ground and location of the forest with regard to neighbouring industries and density of population.

Technical Instruction in Forestry.

The need for a course of instruction in forestry, to be given for the benefit of agents and foresters as well as to the forest apprentices who would be recruited for the Government service, is dealt with at considerable length, and can be briefly summarised. As regards the apprentices, their training should be of a thoroughly practical nature, and they would be required to carry out all types of forest and nursery work under an experienced forester, while indoor theoretical work, although equally essential, should be made subsidiary and supplementary to that and should be done at times of the year when outdoor work makes the least demand on their time. A good grounding in the four main branches of forestry—silviculture, protection, management and utilisation—should be given and a necessary elementary knowledge of plant physiology and agricultural chemistry, "the two sciences upon which the art of forestry must establish itself." Such a course for the training of practical foresters was estimated to take from eighteen months to two years, and during that time it was recommended that apprentices should get a small weekly wage in addition to board and lodging and instruction.

It was advised that the school should be under the charge of a Director (non-resident), and a Forester (resident), and that it should be at no great distance from Dublin in order that lecturers in cognate sciences at the Royal College of Science might occasionally give a lecture in the school, and that the Director might also lecture in the Royal College of Science in a suggested more advanced course for agents, stewards and estate foresters. For these reasons, Avondale House and

Whalley Abbey, both in Co. Wicklow, were recommended as being eminently suitable, and for the same reasons Carrick-on-Suir was ruled out although it was otherwise ideal, because of the extensive woods in the neighbourhood, the ozier beds on the Suir and the various wood-consuming industries in the town. A nursery with the school was, of course, essential.

The more advanced course for agents, stewards and foresters would not involve the day after day manual work necessary in the case of apprentices, but a short course of practical work might be undertaken at the forest school. In the curricula of Continental schools for forest officers, and at British Universities much of the student's time is taken up with cognate sciences such as botany, zoology, geology, surveying, etc., but nothing so elaborate as this was suggested, nor is a deep academic knowledge of these subjects necessary for the administration of forestry work. If attention is paid only to the four main branches of forestry such a course could be covered in 100 to 120 lectures given during the summer months with weekly or fortnightly excursions to woodland centres of practical interest. It was suggested that the Director of the forestry school might give these lectures at the Royal College of Science; at a rate of two lectures a day, the course would be of 50 to 60 days' duration, and in addition to the excursions it would be further improved by a suggested two weeks' visit to the Continent where "forestry on a more extensive scale, and in a more intensive manner could be seen." A fortnight in a Continental country is much too short a period to learn a great deal concerning the forests and forestry practice there, and a visit to a well-managed Scottish or English estate would probably be of more value. However useful such a course may have been fifty years ago, it would be of little value to-day when the majority of the large estates have been parcelled into self-contained farms and the employment of stewards and foresters by private landowners has become almost a thing of the past.

Summary.

1. Only one-fifth to one quarter of the existing woods in the south-east counties of Ireland were originally formed with the intention of working for profit.
2. Growing stock was much less in volume and quality than it should have been owing to heavy thinning and it was much more liable to damage from wind.
3. The market for home-grown timber was very poor, the chief market being for larch for export to England and Wales.
4. Crops of coniferous trees were those most likely to prove profitable and best suited to soil and climate.
5. About 755,928 acres of waste land in the whole of Ireland seemed plantable with a chance of direct monetary profit.
6. Mixed plantations of conifers, made at an average cost of £7 per acre, should prove profitable in the future.
7. Formation of woods and shelter belts would be of great benefit to grasslands and stock-raising.
8. Plantations should be in large blocks, preferably not less than 1,000 acres and shelter-belts should be raised five years before the main planting.
9. There was little likelihood of an increase in the woodland area unless the State accepted the duty of planting and a Forestry Branch of the Department of Agriculture should be set up.
10. Before any great national scheme of planting could be undertaken it would be necessary to provide technical education for practical foresters and, to improve the management of private woods, a course of instruction should be arranged for estate agents, stewards and foresters.