FORESTRY COMMISSION

Fifteenth Annual Report

of the

Forestry Commissioners

for the year ending September 30th

1934

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FIFTEENTH ANNUAL REPORT

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FORESTRY COMMISSIONERS

for the

Year ending September 30th, 1934.

REVIEW OF THE FIRST FIFTEEN YEARS' WORK, 1919-1934.

This Report is the fifteenth issued by the Forestry Commissioners and covers the Forest Year ending September 30th, 1934. In accordance with the procedure adopted at five-yearly intervals, it is proposed to give a general review of the work of the whole period and also of the quinquennium 1929-34.

The reader who is interested in the development of forest policy in Great Britain should refer to the Commissioners' First Annual Report (year ended September 30th, 1920), Fifth Annual Report (1924) and Tenth Annual Report (1929). The last summarised the position to the end of the tenth year in the following words :—

> " *Origin of the Commission.*—The very heavy demands on the home woods during the Great War provided a practical demonstration of the national utility of forests, and in 1918 Government decided that it was necessary for the State to take an active part in the production of timber. This decision was embodied in the Forestry Act, 1919, which followed very closely the advice tendered by the Acland Committee.* Two important principles were followed, first, the work was placed in charge of a body of Commissioners, non-political in character but with a spokesman in the House of Commons, and, second, Parliament undertook to vote in year-to-year instalments against Estimates, a total sum of £3½ millions for the first ten years' work. Both these principles provided for that continuity in policy and outlook which is so essential to success in forestry."

The second principle stated above was not adhered to after the tenth year. In place of statutory provision of funds Government has announced from time to time the amount which it would be

* *Final Report of the Forestry Sub-Committee of the Reconstruction Committee* (Cd. 8881), *May, 1917.*

prepared to recommend Parliament to vote over a series of years for forestry. Thus in 1928 when the statutory provision for the first decade was drawing to a close the Government announced that Parliament would be asked to vote a total sum of £5,500,000 into the Forestry Fund in agreed annual instalments during the ten years commencing April 1st, 1929. In 1929 Government agreed to provide £9,000,000 over the ten financial years 1929-38 and the Commissioners began to work on that basis. In 1931 the annual vote was fixed at £450,000 for the succeeding five years, at which figure it has so far remained. Thus, except that the fluctuations have been rather more violent than under the ten-year block grant system neither method has given the Commissioners the financial security which would be so helpful in arranging, as is necessary, the supply of plants and plantable land several years in advance of planting.

Personnel of the Commission.—A complete list of Commissioners with dates of service was given in the Tenth Annual Report. Subsequent changes are set out below. Sir Roy Robinson succeeded Sir John Stirling-Maxwell as Chairman on March 26th, 1932. There now remain on the Commission only three original members, namely, Sir Roy Robinson, Sir Francis Acland and Colonel W. Steuart-Fothringham. Mr. A. G. Herbert has been Secretary throughout.

	First Appointment.
Sir John Stirling-Maxwell (Third Chairman—resigned 25th March, 1932)	29th November, 1919.
Sir Roy Robinson* (Fourth Chairman)	29th November, 1919.
Sir Francis Acland, Bt., M.P.*	29th November, 1919.
Col. W. Steuart-Fothringham* ...	29th November, 1919.
Sir Hugh Murray (retired 28th November, 1934)	23rd January, 1924.
Mr. W. R. Smith*	27th February, 1925.
Col. Sir George Courthope, Bt., M.P.*	11th October, 1927.
Major C. W. M. Price (retired 28th November, 1929)	16th January, 1929.
Mr. D. R. Grenfell, M.P.*	29th November, 1929.
Mr. J. H. Alpass, M.P. (resigned 16th March, 1932)	29th November, 1929.
Major S. Strang Steel*	26th March, 1932.
Sir Alexander Rodger*	25th May, 1932.
Sir John Sutherland*	29th November, 1934.

* Member of the present Commission.

Mr. W. L. Taylor succeeded the late Mr. H. A. Pritchard as Assistant Commissioner for England and Wales on December 1st, 1932, and Mr. John M. Murray succeeded Mr. (now Sir) John Sutherland as Assistant Commissioner for Scotland on November 29th, 1934, on the latter's appointment as Commissioner.

The Staff.

The Commissioners desire to pay tribute to the work of their staff both outdoor and office.

It so happens that of the five years now under review two have been very hazardous fire years. Forest protection has thrown a very heavy burden on all field officers. Foresters and foremen have had long turns of continuous duty on patrol and fire-fighting which they have done cheerfully and efficiently. The increasing programme of unemployed training camps has thrown much additional work on Divisional and District Officers as no organised staff has hitherto been employed on the Commission's side of the work.

The indoor staff remains comparatively small but nevertheless deals promptly and efficiently with the administrative, accounting and clerical work.

Finance.

The total sum paid into the Forestry Fund from the Exchequer during the fifteen financial years ended March 31st, 1934, was £6,276,800, of which £3½ millions was the statutory provision made under the Forestry Act, 1919, for the first decade ended March 31st, 1929, and sums totalling £2,776,800 were voted from year to year by Parliament during the subsequent five years. Receipts from operations amounting to £783,755 in the first decade and to £770,928 in the next five years were also paid into the Fund. Expenditure amounted to £4,147,735 in the first decade and £3,664,143 in the five-year period, 1929-34.

Period.	Payments into Forestry Fund.			Expenditure.
	Parliamentary Votes.	Receipts from Operations.	Total.	
	£	£	£	£
First decade ...	3,500,000	783,755	4,283,755	4,147,735
11th–15th years, inclusive ...	2,776,800	770,928	3,547,728	3,664,143
Total, 15 years	6,276,800	1,554,683	7,831,483	7,811,878

Comment was made in the Commissioners' Tenth Annual Report on the inconvenience and waste resulting from sudden changes

which had been made from time to time in the scale of financial provision. It was then remarked :—

> " The object of the ten-year programme was to avoid uncertainty. Uncertainty is the worst enemy of the Commissioners' work, and they have therefore noted with satisfaction that successive Chancellors of the Exchequer have come more and more to appreciate that point of view."

Unfortunately, the quinquennium 1929-34 witnessed an even greater fluctuation in the finances of the Commission than had been previously experienced. In 1930 expenditure was proceeding at the rate of approximately £850,000 per annum, being part of a programme for the decade 1929-38 which contemplated a total expenditure of £11,160,000. As a result of the crisis in the national finances and the Report of the Committee on National Expenditure the Commissioners were called upon to reduce their estimated expenditure for the financial year 1931 from £1,049,380 to £899,380 and the Government fixed the Commissioners' Parliamentary Grant at £450,000 per annum (which, with estimated receipts of £150,000, would permit of annual expenditure of £600,000) for the five-year period 1932 to 1936 inclusive. A total saving of £172,000 was made in the financial year 1931 and operations generally were adapted to the new scale of finance, but not without considerable waste including the destruction of large numbers of nursery plants.

Review of Receipts and Payments.

As the financial year closes on March 31st when forestry operations are still proceeding actively, it has been found more convenient to adopt for accounting purposes the forest year ending September 30th. The main heads of revenue and expenditure are therefore reviewed to September 30th, 1934, covering a period of practically fifteen forest years from the date of establishment of the Commission.

Receipts from operations during the fifteen years amounted to £1,642,425, of which the main items were :—

	£	*Per cent.*
Forestry Operations—		
Sales of land and buildings ...	94,790	5·8
Rents and mining royalties ...	602,425	36·7
Forest produce	617,840	37·6
Other sales (including live stock, rabbits, farm produce, etc.) ...	188,280	11·5
Forest Workers' Holdings—		
Rents	98,700	6·0

Payments amounted to £8,115,076 distributed according to accounting subheads as follows :—

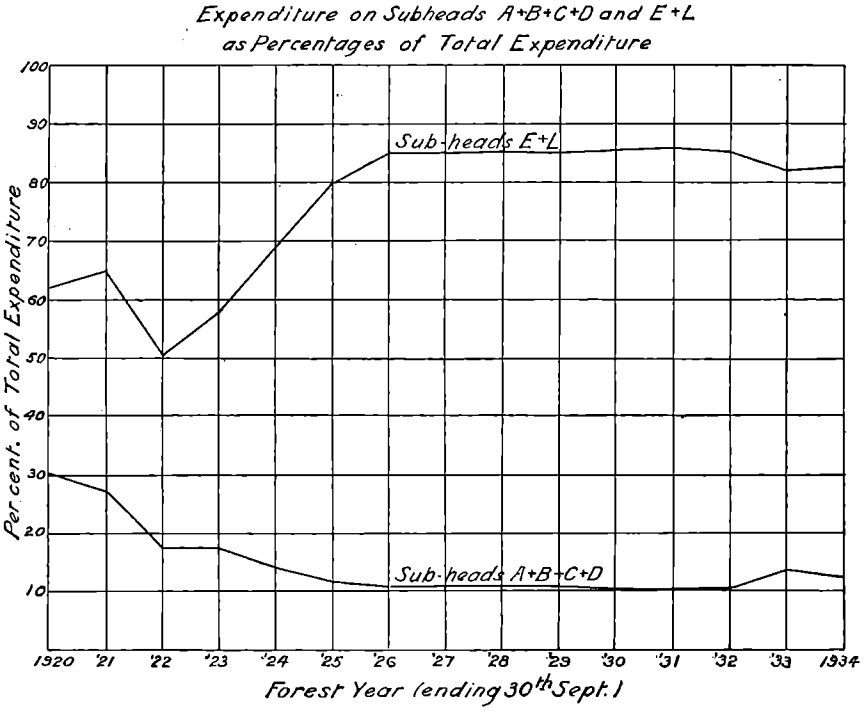
	£	*Per cent.*
A.—Salaries, Wages and Allowances ...	811,207	10·0
B.—Headquarters' Charges	44,703	0·6
C.—Assistant Commissioners' Charges...	52,738	0·6
D.—Divisional Officers' Charges	122,496	1·5
E.—Forestry Operations	5,913,842	72·9
F.—Advances for Afforestation Purposes	275,866	3·4
G.—Education	113,206	1·4
H.—Research and Experiment...	71,635	0·9
J.—Agency and Advisory Services	91,776	1·1
K.—Special Services	26,274	0·3
L.—Forest Workers' Holdings ...	591,333	7·3
Total ...	£8,115,076	100

Of the above subheads, A, B, C and D represent payments in connection with the staff (excluding foresters and foremen) and administration of the Commission. Subheads E (Forestry Operations) and L (Forest Workers' Holdings) represent the main effective functions of the Commissioners; G (Education), H (Research and Experiment) and K (Special Services) are of assistance in carrying out these main functions and also help in the general development of forestry in this country, while F (Advances for Afforestation Purposes) and J (Agency and Advisory Services) serve only the latter object.

The Commissioners have maintained their policy of devolving responsibility so far as consistent with efficiency and thus keeping expenditure on staff and administration (subheads A, B, C and D) at the lowest possible figure. In the early stages, when the work was in process of organisation and planting operations were small, the proportionate total of these subheads was necessarily high and amounted in 1920 to 30·3 per cent. of the total expenditure on all heads. From that figure it fell to 13·9 per cent. in 1924 and to 10·1 per cent. in 1931, but rose to 13·6 per cent. in 1933 owing to the drastic curtailment of operations imposed by the Government although actual expenditure on subheads A, B, C and D was £6,000 less than in 1931. In 1934 there was a slight fall to 12·9 per cent. and the average for the fifteen years is 12·7 per cent. If the totals of these subheads are compared with turnover (payments plus receipts), to which they more properly relate, the corresponding figures are 27·2 per cent. for 1920, 11·1 per cent.

for 1924, 8·4 per cent. for 1931, 10·1 per cent. for 1934 and 10·6 per cent. for the average of the fifteen years.

While the proportion of expenditure on staff and administration was falling until 1931, that on the effective heads of E (Forestry Operations) and L (Forest Workers' Holdings) was increasing. This is clearly brought out in the diagram below.



From 1920 to 1922 inclusive the planting programme was on an expanding basis; for reasons of finance it then remained steady at approximately 10,000 acres per annum for two years when the expanding programme was resumed. In 1931 the area planted amounted to 25,630 acres, but in the following year restricted funds again brought about a curtailment and since 1932 the planting programme has been stabilised at approximately 21,000 acres per annum. The Crown woods were transferred to the Commissioners in 1924. The formation of forest workers' holdings was commenced towards the end of 1924 and the number completed each year rose from 61 in 1925 to 264 in 1931 but fell to 115 in 1932, to 42 in 1933 and to 35 in 1934.

A clearer view of the objects on which expenditure has been incurred may be obtained from Table IIa (p. 64), in which the cost of staff and administration has been distributed over subheads E to L in order to arrive at the total cost of each service under

these subheads. The following table shows the percentage distribution of expenditure for various years. Forestry Operations accounted for 86·6 per cent. of the total expenditure in 1920 and 75 per cent. in 1924 (in which year there was abnormal expenditure on another subhead, namely, Advances for Afforestation Purposes, in respect of relief of unemployment). Forestry Operations and Forest Workers' Holdings together accounted for 94 per cent. of the expenditure in 1929 and for 93·8 per cent. in 1934.

Distribution of Expenditure—based on Table IIa, p. 64.

Subhead.	1920 and 1921.	1924.	1929.	Average of 10 years.	1934.	Average of 15 years.
	£	£	£	£	£	£
Total Expenditure	387,567	329,713	692,988	448,565	637,529	543,152
Allocation :	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
E.—Forestry Operations	86·6	75·0	83·4	78·3	90·5	81·7
F.—Advances for Afforestation Purposes ...	0·4	14·3	2·2	5·4	2·6	4·0
G. and H.—Education, Research and Experiment ...	9·6	4·7	3·1	4·0	3·0	3·5
J.—Agency and Advisory Services	2·0	1·1	0·2	2·2	0·2	1·3
K.—Special Services...	1·4	3·1	0·5	1·4	0·4	0·9
L.—Forest Workers' Holdings ...	—	1·8	10·6	8·7	3·3	8·6
	100	100	100	100	100	100

As Forestry Operations and Forest Workers' Holdings form the bulk of the expenditure further details of these two subheads may be of interest. The following table shows that during the fifteen years under review 16·1 per cent. of the expenditure on Forestry Operations was in respect of Overhead Charges and Supervision; 23·2 per cent., Acquisition of Land; 42·8 per cent., Cultural Operations; 3·6 per cent., Preparation and Sale of Produce; 3·5 per cent., Roads and Buildings, and 10·8 per cent., Stores and Miscellaneous (including rates and taxes, purchase of sheep stock, farming and estate expenses). The first item (comprising Overhead Charges 5·1 per cent., Superior Supervision 5·3 per cent. and Local Supervision 5·7 per cent.) may appear high but it should be explained that much of this expenditure is not related to current planting operations but covers time spent on examining and reporting on land for acquisition and on collection of receipts from rents, sales of produce, etc.

Distribution of Expenditure on Subhead E—Forestry Operations (Table E, p. 66).

	1920 and 1921.	1925.	1929.	Average of 10 years.	1934.	Average of 15 years.
	£	£	£	£	£	£
Total Expenditure	334,148	405,972	577,836	351,258	576,853	443,659
Allocation:	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Overhead Charges, Superior Supervision and Local Supervision	21·9	15·0	14·7	16·2	18·3	16·1
Acquisition of Land ...	37·8	25·0	25·9	22·4	16·5	23·2
Cultural Operations	31·5	40·4	41·0	43·0	46·0	42·8
Preparation and Sale of Produce	0·6	3·9	3·6	3·4	5·4	3·6
Roads and Buildings...	2·8	4·6	2·9	3·3	3·2	3·5
Stores and Miscellaneous ...	5·4	11·1	11·9	11·7	10·6	10·8
	100	100	100	100	100	100

As regards Forest Workers' Holdings, 11·7 per cent. of the expenditure was on Overhead Charges and Superior Supervision (a considerable amount of building work was done by direct labour); 23·2 per cent. on Purchase and Rent of Land and Buildings; 58·7 per cent. on Buildings (new buildings, adaptations and repairs); 5·2 per cent. on Fencing, Drainage and other permanent improvements, and 1·2 per cent. on Rates, Taxes, etc.

It will be noticed that overhead charges and superior supervision in 1934 accounted for 34·9 per cent. of the total expenditure. These charges cover management of existing holdings, collection of rents, etc., and must necessarily form a high proportion of total expenditure in those years when few new holdings are being established.

Distribution of Expenditure on Subhead L—Forest Workers' Holdings (Table L, p. 90).

	1925.	1929.	Average 1924–29.	1934.	Average 1925–34.
	£	£	£	£	£
Total Expenditure ...	56,522	73,214	64,980	21,417	64,063
Allocation:	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Overhead Charges and Superior Supervision	6·5	12·3	9·2	34·9	11·7
Purchase and Rent of Land, Buildings, etc.	48·4	10·6	26·7	21·2	23·2
Buildings (new, adaptations and repairs)	41·6	67·7	58·6	34·0	58·7
Fencing, Drainage, etc. ...	1·1	8·6	4·5	5·8	5·2
Rates, Taxes and Other ...	2·4	0·8	1·0	4·1	1·2
	100	100	100	100	100

Forest Policy.

The accepted basis of Forest Policy which has been the standard of reference during the Commission's existence is that propounded by the Acland Committee in 1917. Viewing the position as a whole the Committee found that it was necessary to maintain in a productive state the three million acres of existing woodlands (97 per cent. of which was privately owned) and to add 1,770,000 acres by afforestation. They assumed that the maintenance of the existing woodlands (including replanting of war fellings) could be entrusted to private owners, leaving most of the afforestation to be carried out by the State. It was realised that the assumption might be inaccurate and, to ensure that the requisite area of woodland should be obtained, the Committee further proposed to increase or diminish the State programme according to the activities of private owners.

In allocating afforestation to the State, the Committee proposed the following rate of planting conifers :—

	Acres.
In the first 10 years	150,000
In the first 40 years	... 1,180,000
In the first 80 years	... 1,770,000

Some provision was also made for planting hardwoods. The acquisition of 20,000 acres of devastated woodlands—the type of land considered to be most suitable for the purpose—was to be achieved in the first decade, although the area to be planted was left unspecified.

The Acland Committee also laid down an annual planting programme for the first decade. Beginning with no planting at all in the first year, the rate was to increase annually by 3,300 acres per annum to 30,000 acres in the tenth year. Thereafter an average of 34,300 acres per annum would ensure the total area of 1,180,000 acres required by the fortieth year.

A programme of land acquisition based on the planting programme for the first decade was also laid down. The total area to be acquired was 402,000 acres, of which 382,000 acres were destined for conifers and 20,000 acres for hardwood plantations.

As regards the maintenance of existing woodlands, the Acland Committee did not suggest any method of estimating progress. The Committee realised, however, that the most important matter immediately after the war would be to get the felled areas replanted as quickly as possible, and they provided, in their estimates of cost, for State grants to local authorities and private owners for replanting and afforesting 110,000 acres in the course of the first decade.

Results compared with the Acland Programme.

The next step is to compare the forestry work done in Great Britain with the objectives laid down by the Acland Committee. As already pointed out the objectives were two, the State afforestation programme and the maintenance of the existing woodlands.

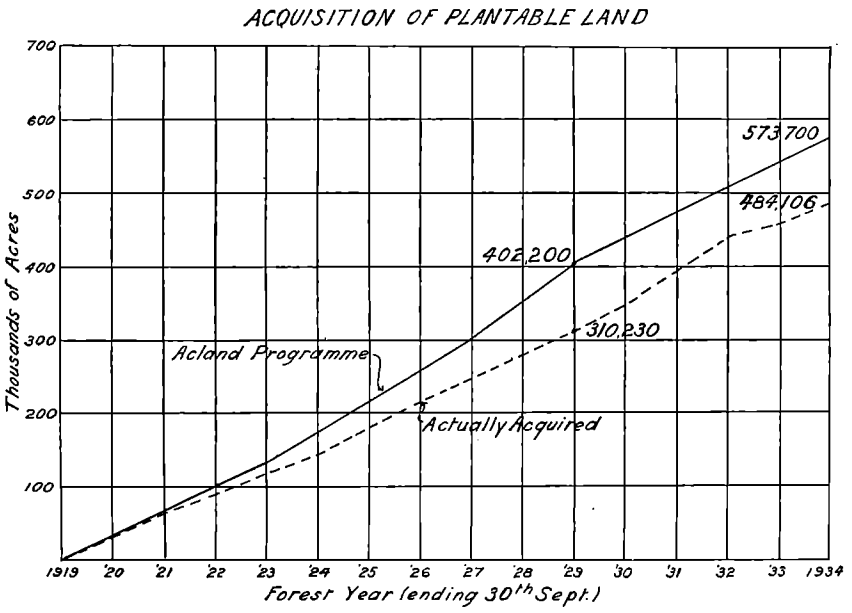
State Afforestation.—In practice it has not been found possible to confine the Commissioners' operations to the simple lines of the acquisition and afforestation of bare land with conifers and the acquisition and planting of devastated woodlands with hardwoods. The acquisition of afforestable land has frequently entailed also the acquisition of agricultural land, standing plantations and sometimes of surplus assets such as residential properties. The devastated woodlands which it was possible to secure have not always been suitable for the growth of hardwoods and have fallen sometimes into the category of those which the Acland Committee had relegated to maintenance by private owners. Further in 1924 the bulk of the former Crown woodlands, amounting to approximately 56,000 acres, was transferred to the Commission, and felling, natural regeneration and planting have gone on steadily in them.

The total area of plantable land acquired in the first decade was 310,230 acres, a deficit of 91,770 acres on the Acland Programme for acquiring 402,000 acres. During the next five years the plantable area acquired amounted to 173,876 acres. This provision is equivalent to the average planting programme of 34,300 acres per annum envisaged by the Acland Committee but makes no practical contribution towards the deficit accumulated in the first decade. Nor do the acquisitions take account of the important fact, referred to immediately below, that a considerable proportion of the forest land held by the Commissioners was due under the Acland Committee proposals to be replanted by the former owners.

Acquisition of Plantable Land.

Year ending 30th Sept.	By Lease or Feu.	By Purchase.	Total.		
			Actual.	Acland Proposals.	Excess (+) Deficit (−)
	Acres.	Acres.	Acres.	Acres.	Acres.
First decade :—					
1920–29	156,759	153,471	310,230	402,000	— 91,770
Second decade :—					
1930	8,409	25,951	34,360	34,300	+ 60
1931	4,851	44,007	48,858	34,300	+ 14,558
1932	4,970	41,467	46,437	34,300	+ 12,137
1933	2,885	12,450	15,335	34,300	— 18,965
1934	11,581	17,305	28,886	34,300	— 5,414
Total ...	189,455	294,651	484,106	573,500	— 89,394

Note.—In addition, 4,866 acres were acquired in Ireland to March 31st, 1922.



As shown in the table below, the total area planted to September 30th, 1934, was 254,384 acres. New planting accounted for 241,185 acres and replacements 13,199 acres, which, however, includes 4,192 acres replanted after damage by fire.

Area Planted.

Year ending 30th September.	Proposed to be Planted.	Actually Planted.			Excess (+) Deficit (—) on Decade or Annual Programme.
		New Planting.	Replacements.	Total.	
	Acres.	Acres.	Acres.	Acres.	Acres.
First decade, 1920–29:					
Conifers	150,000	126,444	4,316	130,760	—19,240
Hardwoods ...	unspecified	6,365	1,146	7,511	
				138,271	
Second decade:					
1930	25,000	21,404	3,698	25,102	+102
1931	25,000	24,234	1,396	25,630	+630
1932	20,000*	21,959	704	22,663	+2,663
1933	20,000*	20,394	657	21,051	+1,051
1934	20,000*	20,385	1,282	21,667	+1,667
Total	—	241,185	13,199	254,384	—

* Minimum area.

Note.—In addition, 1,697 acres were planted in Ireland to March 31st, 1922.

In order to assess the Commissioners' work in terms of the simple formula of the Acland Committee it is necessary to sub-divide in various ways the total area which has been planted.

During the first decade the total area planted was 138,270 acres, of which 130,760 acres were with conifers and 7,510 acres with hardwoods. The area *afforested*, i.e., newly planted land, was 101,980 acres, of which 98,350 acres were with conifers and 3,630 acres with hardwoods. The deficit on the conifer afforestation programme of 150,000 acres was consequently 51,650 acres.

From the 11th to the 15th years inclusive, the total area planted was 111,920 acres (103,040 acres conifers and 8,880 acres hardwoods), of which 81,510 acres were afforested (77,650 acres conifers and 3,860 acres hardwoods).

These figures may be arranged, according to the two main objectives of the Acland Committee in the following way:—

1. Conifer afforestation programme:

	Acres.		Acres.
In the first decade ...	98,350	(deficit	51,650)
„ „ 11th to 15th years ...	77,650	(„	93,850)
Total	176,000	(„	145,500)

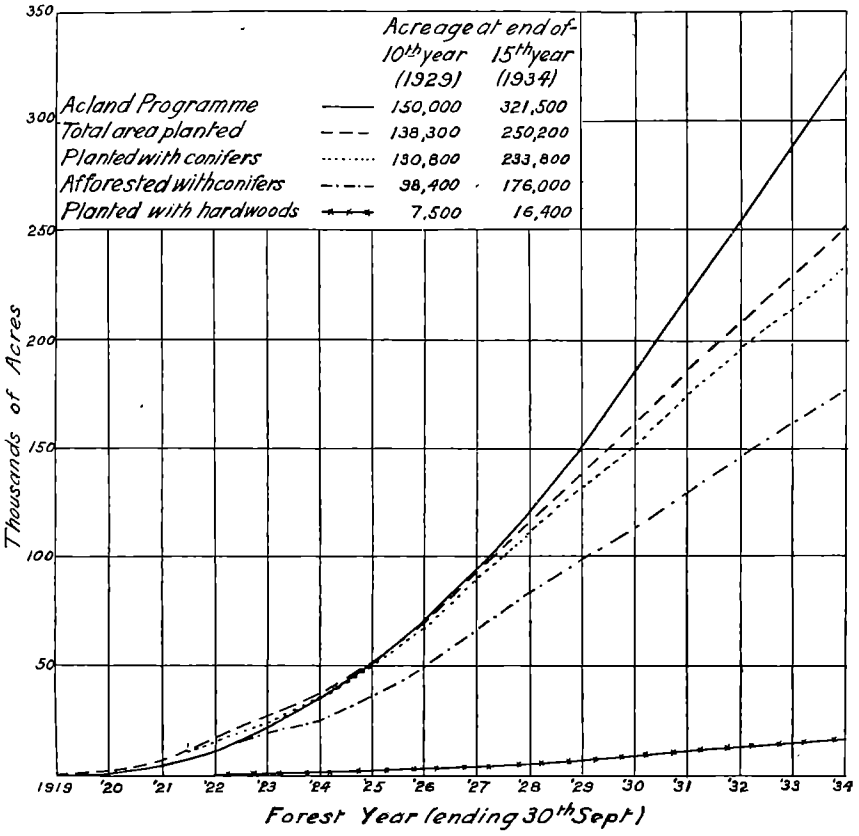
2. Replanting of woodlands:

	Acres.
In the first decade	39,920
„ „ 11th to 15th years	34,270
Total	74,190

For simplicity the areas *afforested* with hardwoods (7,490 acres in all) are included in this contribution.

In brief the State planting work considered over the whole 15 years is 145,500 acres in arrears as regards afforestation with conifers but has contributed 74,190 acres towards the maintenance of existing plantations.

AREAS PLANTED



Maintenance of existing Woodlands.—It is not in general possible to express precisely in terms of planting alone how far the existing woodlands are being maintained because other questions, such as thinning and protection, come into consideration. Nevertheless it is essential to replant felled areas where they do not regenerate themselves naturally.

The census of woodlands made in 1924 showed that the total area of felled or devasted woodlands in Great Britain was 478,100 acres, most of which was a legacy of war and post-war fellings. Since that date plantings and fellings have proceeded. The grants which the Commissioners make for planting, although they do not cover the whole of the planting, account for by far the greater part and consequently afford a good indication of what is being done. The total area planted by means of grants or loans to September 30th, 1934, was 100,530 acres (*see* table below). The average area in the last five years was 5,580 acres. Adding the Commissioners' contribution of 74,190 acres to the 100,530 acres, a total figure of

174,720 acres is reached. When all unrecorded plantings are included it is unlikely that the total area planted during the 15 years in existing woodlands has exceeded 200,000 acres.

Unfortunately there are no recorded figures of fellings. It may be estimated, however, from censuses of production made in 1924 and 1930 that the quantity of plantation timber of sawmill size felled annually is of the order of 25 million cubic feet. That quantity alone would require the felling of a minimum of 8,000 acres, or 120,000 acres in the 15 years. On the most favourable estimates, therefore, not more than 80,000 acres of leeway have been made up, leaving still unplanted some 400,000 acres of felled and devastated woodlands.

In other words it is more than doubtful whether any real progress has been made in maintaining the existing woodlands on even the relatively low pre-war standard.

Area Planted by Means of Grants.

	Acres.
First decade :	
1920-29 ...	72,618
Second decade :	
1930 ...	6,651
1931	5,917
1932	5,184
1933	4,574
1934	5,585
	100,529

Future Policy.

From the foregoing discussion it will be clear that, as regards both objectives laid down by the Acland Committee, namely, the provision of coniferous plantations and the maintenance of existing woodlands, the programmes are seriously in arrears and further that, as measured by the Acland Committee standards, the current efforts which are being made to promote forestry are quite inadequate. It may be argued that the standards are too severe, but the Commissioners with all the facts at their disposal are not of that opinion. In any event the existing standards must be used until they have been authoritatively replaced by better ones.

In considering the two main agencies of British forestry, namely, State and private, it may be fairly stated that the scale of the former is almost entirely dependent on finance. By administrative and technical methods the Commissioners may make the money placed at their disposal the instrument of producing rather more or rather less growing timber, but in practice the limits of variation are not significant in relation to the whole problem.

The problem of promoting private forestry cannot be stated in such simple terms. The first essential of successful forestry is stability of outlook, and the second, continuity of management. Owners of woodland will not replant, except for pleasure, unless they are reasonably certain as to the future. Again, changes of ownership and management too often mean the felling of immature plantations and the neglect of young ones. Under the economic conditions which have obtained since the war the scales have been heavily weighted against private forestry and from present indications are likely so to remain.

The difficulty is not peculiar to Great Britain. In the United States failure to maintain private forests has become so evident as to bring into disrepute the whole system of private ownership and exploitation.

The Commissioners have taken the advice of their Consultative Committees on this subject. Certain indirect methods of encouragement, such as the provision of technical advice, issue of publications, and so on, have been suggested and acted on where they were not already in use. These measures, the Commissioners feel, will not overcome the fundamental difficulties referred to above, however helpful they may be to the relatively small proportion of owners who intend to maintain their woods.

It has also been suggested that by increasing the value of planting grants more private planting might be secured. The Commissioners have no evidence that any reasonable grant would make a real contribution towards the solution of the main problem.

If advice is sought from other countries, it will be found that in a number of them restrictions have been placed on the users of forests and woodlands. Such restrictions range in severity from Government regulation of fellings in so-called "Protection Forests", to the regulation of fellings in all woods, coupled with compulsory replanting. The last named if efficiently administered would no doubt be effective in maintaining the woods of Great Britain; it would entail, however, interference with the rights of a particular form of private property in a way that has not hitherto been contemplated in respect of any other form.

The present arrangement for financing the work of the Commission allows of a gross expenditure of approximately £600,000 per annum and expires at the end of the financial year 1936-37. The scale on which operations can then be conducted will depend on the steps which are taken to provide stocks of nursery plants and to secure plantable land. After reviewing the whole position the Commissioners accordingly, in January, 1935, prepared for submission to Government proposals for action. Briefly, they were on the following lines:—

(1) *Immediately* to speed up the acquisition of land and the supply of plants.

(2) *Over the next four years* to work up the planting programme gradually to 30,000 acres per annum.

(3) Thereafter to continue expanding the programme up to a maximum of 45,000 acres per annum.

As regards forest workers' holdings 40 new holdings per annum would probably be sufficient for the normal working of the forests. Many more could no doubt be made. Forest holdings in themselves are, at least, as cheap and effective a form of land settlement as has yet been devised.

To take the immediate steps suggested would entail an increase of £100,000 in the Vote for 1935 (from £450,000 to £550,000) which would allow a gross expenditure of £700,000 for the year. The proposal to work up the planting programme to 30,000 acres in four years would entail an average annual grant of £630,000 which would allow a gross expenditure of £780,000 for each of those years.

The cost of the long-term programme, working up to 45,000 acres per annum would depend to a great extent on the acceleration of the planting programme. Assuming it took 14 years (an acceleration of 1,500 acres per annum) the net cost would range from £700,000 in the 5th year (1939) to £1,000,000 in the 14th.

The Commissioners' Estates.

At September 30th, 1934, the Commissioners had under their charge approximately 909,000 acres of land which represent a net increase of 307,000 acres on the 602,000 acres held at the same date in 1929. Of the total, 495,000 acres have been acquired by purchase (net increase 244,000) and 294,000 acres (net increase 63,000 acres) by long lease or feu. The balance, approximately 120,000 acres (56,000 acres existing forest), represents the areas transferred from the Commissioners of Crown Lands under the Transfer of Woods Act, 1923.

In accordance with their general policy the Commissioners have continued, concurrently with acquisitions, to dispose of assets not required for establishing or working the forests or for the formation of forest workers' holdings. The value of such disposals during the five years 1929-34 amounted to £42,800.

The table below shows for England and Wales and for Scotland, the broad uses to which the land is, or will be, put. Details by Divisions are given on page 69.

It will be observed that 544,000 acres are, or will become, forest; nurseries account for 801 acres, agricultural land for 29,000 acres, and forest workers' holdings 11,600 acres. The remainder amounting to 324,000 acres consists for the most part of high unplantable hills and land subject to rights of common.

Forestry Commissioners' Estates: Utilisation of Land at September 30th, 1934.

	Country.		
	England and Wales.	Scotland.	Total, Great Britain.
Forest Land—	Acres.	Acres.	Acres.
Acquired Plantations	58,500	7,500	66,000
Planted by Forestry Commission	158,000	92,000	250,000
To be planted	128,500	99,500	228,000
Total	345,000	199,000	544,000
Nurseries	490	311	801
Agricultural	19,000	10,000	29,000
Forest Workers' Holdings ...	9,500	2,100	11,600
Unplantable and Miscellaneous...	103,000	221,000	324,000
Grand Total	477,000	432,000	909,000

Property other than Forest.—The estates acquired by the Commissioners include many subjects other than forest. The table below gives a list, exclusive of forest workers' holdings, of subjects and rentals at September 30th, 1934. The total number of lettings was 4,559 of an annual value of £79,585. The corresponding figures five years previously were 3,486 and £59,847.

Subjects and Rentals at September 30th, 1934.

Description.	England and Wales.		Scotland.		Total, Great Britain.	
	No.	Rental.	No.	Rental.	No.	Rental.
		£		£		£
Agricultural Holdings :—						
Under £20 p.a.	421	2,679	263	1,626	684	4,305
Over £20 p.a.	250	18,838	145	10,855	395	29,693
Foresters' Houses (including District Officers' Houses in Scotland)	102	—	51	180	153	180
Cottages	263	2,384	161	865	424	3,249
Residential and Sporting ...	268	11,002	176	8,598	444	19,600
Mines and Quarries	314	17,933	6	248	320	18,181
Other (easements, permissions, etc.)	1,888	3,434	251	1,416	2,139	4,850
Totals	3,506	56,270	1,053	23,788	4,559	80,058

The agricultural holdings have been acquired with plantable land and are retained pending redistribution of the land when planting

commences, for possible subdivision into forest workers' holdings or for sale.

Under mines, the chief subject is the Forest of Dean coalfield which was transferred with the woodland from the Commissioners of Crown Lands. The subjects described as " other " in the table include a great number of easements incidental to the ownership of land. Many of them relate to the New Forest and Forest of Dean and are of long standing.

A separate section of this report is devoted to forest workers' holdings (p. 43). The number of holdings at September 30th, 1934, was 1,233, of which 615 have been established in the last five years. The total expenditure on these holdings amounted to £704,000 and the gross rental to £18,000.

The Forests.

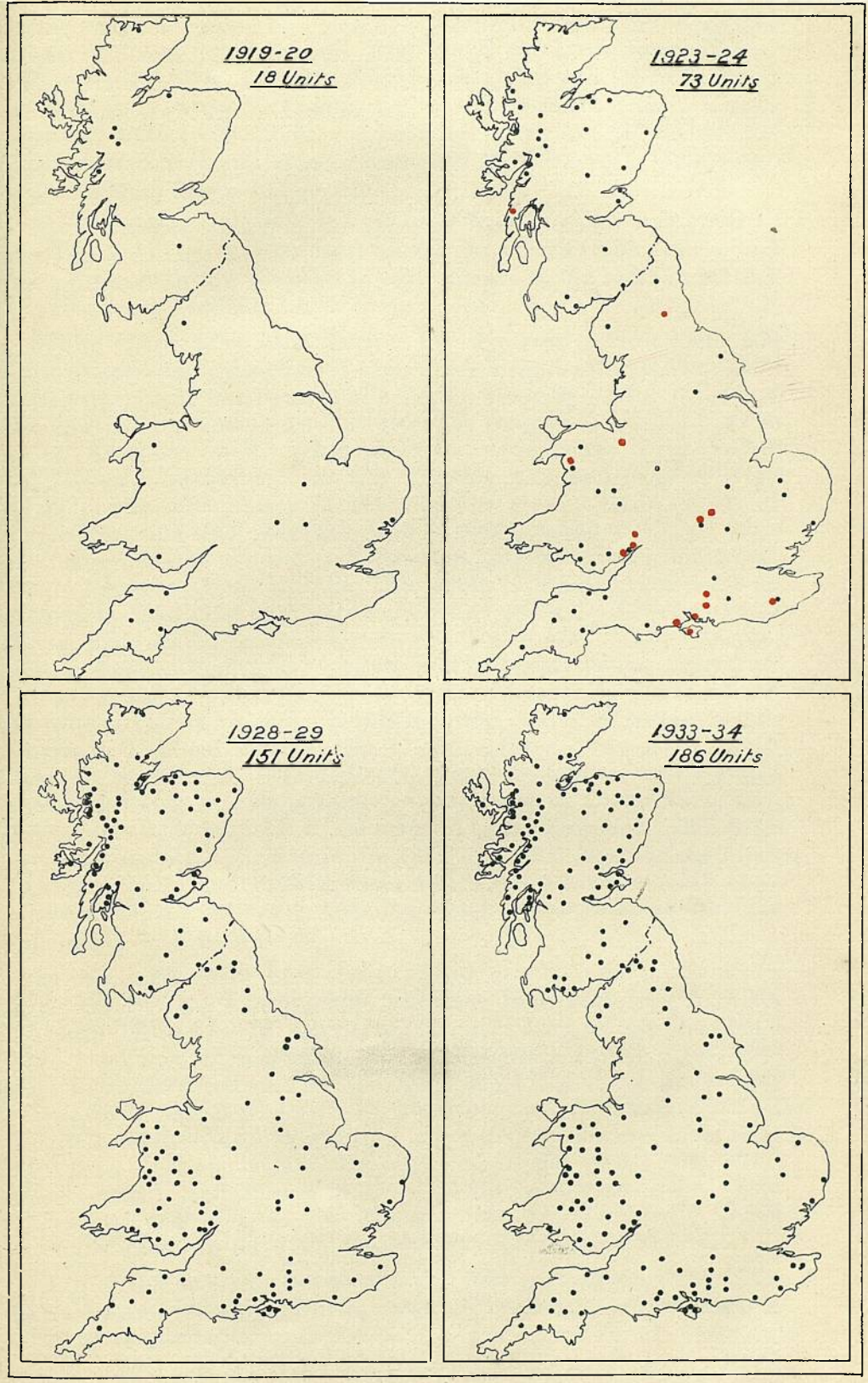
The tabular statement above shows that the total area of plantations at September 30th, 1934, was 316,000 acres, including 250,000 acres planted or replanted by the Commissioners, and 66,000 acres acquired and transferred under the Transfer of Woods Act, 1923. There are also 228,000 acres awaiting planting. The ultimate forest area is consequently 544,000 acres which compares with 367,000 acres five years previously.

The total number of forest units was 186, an increase of 35 in five years. The rate of increase has slowed up, owing partly to the reduction in acquisitions and partly to the fact that with a larger total number of units it is often possible to add new acquisitions to existing units. In 1934 the average unit contained 2,900 acres of plantable land compared with 2,400 acres in 1929. The individual names and distribution of the various units are shown on the maps and lists (p. 70).

Of the 186 units, 74 are in England, 27 in Wales and Monmouth, and 85 in Scotland. The small sketch maps facing this page show the number and distribution of units at the end of the first year (18 units), fifth year (73), tenth year (151) and fifteenth year (186).

As regards size, the units may be classified, on the area of potential forest which they contain, as follows:—

Area.	No. of Units.		
	England and Wales.	Scotland.	Great Britain.
Acres.			
Under 500	7	5	12
500—1,000	19	17	36
1,000—2,000	33	25	58
2,000—4,000	20	25	45
4,000—8,000	14	11	25
8,000 and over	8	2	10
Totals	101	85	186



Sketch maps illustrating the progress of the acquisition of forest units. Forests transferred under the Forestry (Transfer of Woods) Act 1923 are shown by means of red dots in the map 1923-24

Malby & Sons, Lith.

The largest units, by plantable acreage, were, in England, Thetford Chase (34,000 acres), Kielder (28,000 acres), Dean Forest (23,000 acres), New Forest (22,000 acres), Allerston (10,000 acres); in Wales, Gwydyr (11,000 acres), Clocaenog (9,000 acres), Coed-y-Brenin (9,000 acres); in Scotland, Loch Ard (11,000 acres), Clashindarroch (8,000 acres), Knapdale (6,000 acres), Glenhurich (5,000 acres), Nevis (5,000 acres).

A general description of the types of land acquired was given in the Tenth Annual Report (year ending September 30th, 1929), and it is proposed on this occasion to refer mainly to the more important of subsequent acquisitions.

While there have been during the five-year period some 260 acquisitions widely distributed over Great Britain, the most important development has been in the Border Country in the valleys of the North Tyne and Rede. In 1929 the Commissioners held three units, Kershope (4,291 acres plantable) and North Tyne Valley (1,276 acres plantable) on the English side and Newcastleton (2,993 acres plantable) on the Scottish side. By a series of acquisitions the total plantable land has been raised to 46,868 acres in areas which are almost contiguous and promise to form the largest single forest in Great Britain. The whole of the additions were in England. The land is situated almost exclusively on the carboniferous shale which provides a relatively heavy soil. A large proportion is what is known as " white land," the prevailing vegetation being a grass, *Molinia*, or rushes. It is consequently suited for the growing of Norway spruce and Sitka spruce. Other important acquisitions in England include over 11,000 acres, mainly sandy heath land, in Norfolk; in Wales, 10,800 acres plantable of hill country were purchased in Denbighshire, 7,000 acres in Carmarthenshire, 6,300 acres in Merioneth, 5,400 acres in Glamorgan and 5,300 acres in Cardiganshire. In Hampshire (Micheldever), Northamptonshire (Yardley Chase and Rockingham) and in Sussex some 3,250 acres of old woodland have been acquired which are specially suitable for replanting with hardwoods.

In Scotland there have been useful acquisitions in all three Divisions but the most notable additions have been in the South Western Division. In Argyll 15,000 acres of good planting land have been secured including that at Knapdale (6,240 acres) and Inverinan (2,948 acres). Another good district has been the Achray —Strathyre district where 12,000 plantable acres have been secured. In Kirkcudbright and Wigtown a number of new areas have been acquired. These include Kirroughtree (2,596 acres) and Fleet (1,748 acres), and extend in all to 5,500 acres plantable. Two interesting new areas in the Western Isles are Glenbrittle (1,760 acres plantable) in Skye and Torosay (1,880 acres) in Mull.

During this five-year period also the first acquisitions were made in Deeside, namely Durris and Altcailleach, extending to 6,200 acres plantable.

Progress of the Plantations.

The first plantations made by the Commissioners were planted in the winter of 1919-20 and consequently at the end of September, 1934, had passed through 15 growing seasons. Only a very small proportion (0·5 per cent.) of the total area planted is of that age and the proportion aged 11-15 years is only 14·7 per cent. The actual areas arranged in five-year age-classes are :—

	Acres.
1-5 years old	111,921 (44·7 per cent.)
6-10 years old ...	101,509 (40·6 per cent.)
11-15 years old ...	36,762 (14·7 per cent.)

The most interesting stage in the early history of a plantation is the point at which it may be classified as " established," that is to say, when it is growing freely and will not require any appreciable attention (in the way of replacing dead plants, weeding, etc.) until thinning becomes necessary. The time taken by a plantation to become established depends on a number of factors, such as the species planted, the type of plant and method of planting, the weather conditions (especially during the first year), and the character of the soil and of the soil covering. Japanese larch and Douglas fir are notably quick starters while Norway spruce and broadleaved species are the reverse. Occasionally it is possible to state at the end of a single growing season that, ruling out accidents, the plantation is already established. But even where all the conditions are favourable it is not safe to pass a plantation as established until at least three growing seasons have elapsed.

A first census of the plantations three years old and upwards was made at the end of the 1931 growing season and disclosed the fact that, out of a total area of 161,200 acres examined, 88,400 acres (55 per cent.) were established and 72,800 acres (45 per cent.) non-established. The census was repeated after an interval of two years when, out of 187,800 acres, 119,200 acres (64 per cent.) were established and 68,600 acres (36 per cent.) non-established. Included in the 68,600 acres unestablished were 3,380 acres (1·8 per cent. of the total area) concerning which there is considerable doubt whether timber will be produced at an economic figure. The greater part (2,250 acres) is situated in the Northern Division of Scotland and was planted during the earlier years of the Commissioners' work. With increasing experience in the selection of plantable ground, a stricter standard of what land is to be classified as plantable, and a general improvement in methods of planting, the risk of planting unsuitable ground has been practically eliminated. For the same reasons the rate of establishment of the later plantations (which was already noticeable at the second census) should be considerably accelerated.

The second important stage in the history of a young plantation is the first thinning, which is required some time after the individual trees have grown together to form a complete leafy canopy and are beginning to crowd each other unduly. Large areas of the plantations have been in canopy for some time and a few small areas have just come forward for thinning. Henceforward the thinning area will increase annually; the yield at first will consist of small poles suitable for fencing stakes and rustic work. The second thinnings which follow at intervals of three to five years after the first, according to the species and rate of growth, will provide poles of sufficient size to be cut into pitprops and fencing posts.

Private planters may be interested in some of the figures which have been collected as to the rate of growth of different species in thriving plantations. The table below shows for the commoner coniferous species the average height of the trees at 10 and 15 years and also the maximum height of individual trees and the maximum length of the last leading shoot found in any of the plantations of those ages.

Average Height Growth.

Age (Years).	Scots pine.	Corsican pine.	European larch.	Japanese larch.	Douglas fir.	Norway spruce.	Sitka spruce.
	ft.	ft.	ft.	ft.	ft.	ft.	ft.
10	11	11½	11	18½	13½	9½	12
15	18	20	22	28½	21	16½	26½

Maximum Heights and Leading Shoots.

	Height.	Shoot.	Height.	Shoot.	Height.	Shoot	Height.	Shoot.	Height.	Shoot.	Height.	Shoot.	Height.	Shoot.
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
10	20	31	23	24	29	36	23	30	28	60	25	27	25	48
15	26	30	28	30	34	24	40	36	38	48	26½	36	41	48

On the assumption that the sites are reasonably comparable, it will be seen that, as regards Scots pine and Corsican pine, there is little difference in height at the 10th year but by the 15th year the latter begins to go ahead. Japanese larch is markedly faster growing than European larch at both ages and also than Douglas fir. The superiority in growth of Sitka spruce over Norway spruce is indicated, particularly by the 15th year.

The data relating to maximum growth show that the tallest tree measured in any plantation of 15 years of age was a Sitka spruce of 41 ft. in height; in descending order come Japanese larch 40 ft., Douglas fir 38 ft., European larch 34 ft., Corsican pine 28 ft., Norway spruce 26½ ft. and Scots pine 26 ft. The longest leading shoots recorded in the table are Douglas fir 60 in. at 10 years, Sitka spruce 48 in. at 10 and 15 years, European larch 36 in. at 10 years and Norway spruce 36 in. at 15 years. It may be of interest to record also the longest leading shoots actually measured in any of the coniferous plantations and the ages of the respective trees :—

Species.	*Maximum Shoot Length.* in.	*Age.* Years.	*Forest.*
Sitka spruce ...	54	8	Barcaldine.
Norway spruce ...	45	9	Coed-y-Brenin.
Douglas fir ...	63	8	Barcaldine.
European larch ...	48	8	Forest of Dean.
Japanese larch ...	53	6	Dovey.
Scots pine ...	40	11	New Forest.
Corsican pine ...	36	12	Chopwell.

Among broadleaved species, outstanding growth has been made by Oregon alder at Glenfinart, which at an age of 5 years had an average height of 15 ft. The tallest tree in this plantation was 22 ft. high and the longest leading shoot 60 in.

Some of the ash plantations are also very vigorous, notably one in the Forest of Dean, which averaged 31 ft. in height at the age of 12 years. The longest leading shoot measured was one of 36 in. in a plantation of the same age in Mortimer Forest. Beech averages about a foot a year for the first 10 to 15 years but sometimes outstrips the ash. Slowest of all is of course the oak but plantations such as those at Apethorpe and Alice Holt Forests, which average 6 ft. in height at 11 to 12 years of age, are not considered unsatisfactory.

Developments in Forest Technique.

During the last few years there have been a number of interesting developments in plantation and nursery work. Changes of this kind naturally come slowly, and are the results either of practical experience painfully acquired or of gradually maturing research and experimental work. Realisation of the importance of soil aeration to small trees has led to systematic ploughing of tightly-packed soils such as are encountered on the Yorkshire moors (Allerston) and Wareham heaths. Further, the raw humus is mingled with the soil particles, and nutrient material is produced from the resulting decomposition of this humus. Using principally caterpillar tractors and strong ploughs, it is possible to turn over the top 8-10 inches of soil, to break up iron pan where it exists and so to improve the circulation of air and water in the soil. Some four thousand acres have been treated in this way at an average all-in-cost

of 21s. 6d. per acre. The response of young trees, compared with those put into unploughed soil is very marked and the cost of ploughing is more than recovered because the plants do not require weeding and there is no expenditure on fire protection for a number of years.

It has been found also that heavier and more systematic drainage than was formerly practised is desirable on certain types of wet ground. " Contour " drains, which cut off the water before it invades the lower land, have been found effective in hill country. Norway and Sitka spruces are the species normally planted on such sites. The method of " turf-planting " spruces, which began tentatively about ten years ago, has been gradually developed until it is now in universal use. The turfs cut from the drains are inverted and spread evenly over the planting area and the roots of the small plants placed either in the turf or between the turf and the natural surface of the ground. The period of check which spruces normally experience when planted direct into the natural surface is reduced, while the extra cost involved in the first planting is recovered because little or no weeding is necessary. The principle underlying turf-planting is the same as that in ploughing, namely, to encourage the circulation of air and water round the roots.

The technique of afforestation has also been gradually modified in respect of another broad type of which large areas have been acquired. This is land covered with broadleaved vegetation, such as birch and oak scrub, devastated woods in which the new growth of tree species and weeds has assumed formidable proportions, and coppice areas. In all cases the existing woody growth has little or no present or future value. The problem is to replace it with valuable species either coniferous or broadleaved. The earlier method was to clear all growth, to sell what little had a market and to burn the remainder. This cost as much as £3 or £4 per acre and led to great expense after planting owing to the rapid re-growth of coppice shoots. It led also in some cases to the rapid dissipation of humus from the soil and the baking of soils in the drier parts of the country. In the wetter regions the removal of scrub frequently led to marsh-like conditions and increased outlay in drains.

In the case of tall oak and birch scrub to be replaced by conifers, it has been found that all the above disadvantages can be avoided by ringing the trees at the time of planting or soon after. The ringed trees take two or three years to die, and thereafter gradually shed their twigs and branches, so that the young conifers push up and take their places with very little damage to leading shoots. Excellent results have been secured in this way. Planted under dense oak coppice at Barcaldine (Argyll), nine-year old Douglas fir, Sitka spruce and Norway spruce have reached the following heights respectively :—24¾ ft., 18¾ ft. and 12 ft.

The ringing of extensive areas has the disadvantage that it is unsightly for a number of years, and care is now taken, where possible, to screen the operations.

In devastated woodlands and coppice the procedure varies according to the kind of plantation, broadleaved or coniferous, which it is proposed to make. The common broadleaved trees, oak, ash, beech and sycamore, all appear to be sensitive to frost in the early stages and to thrive best if they are not exposed to full light—that is to say they require nursing, which in artificial plantations is often given by a mixture of quicker growing conifers. Grass turf is probably also a disadvantage and in the case of ash definitely a deterrent to growth. By appropriate treatment coppice may be made to do the nursing and at the same time prevent the extensive growth of grass. The most recent development in technique is to plant the broadleaved species in groups about 12 feet square or in drifts about the same width so that in the first instance about half the area is planted and the remainder left under coppice and weed growth for nursing purposes. The groups will gradually be extended, for example, by ringing the intermediate coppice when it has served its purpose. Detailed procedure must be regulated to suit the coppice growth and the kind of plantation required. In the case of mixed plantations of ash and beech, the ash is planted in the original groups and the beech brought in subsequently.

Where areas of the type under discussion are to be replanted with conifers, it is necessary, as in the earlier practice, to cut and burn the coppice before planting, but it has been found from experience that it is a mistake ever to let it grow freely. Moreover, when a weeding is made the shoots must be cut to ground level. This is particularly necessary when there is interplanting with a light-demander like larch.

In nursery practice the constant tendency is to sow seed more thinly, to cull seedlings and transplants more heavily, to increase the humus contents of the soil, and to place a larger proportion of the ground under greencrop and fallow. Density of sowing and culling are closely connected. Dense seedbeds produce drawn-up plants with a large proportion of culls, and the plants selected for lining-out similarly produce a high proportion of transplant culls.

Choice of Species and Planting Methods.—There is a natural tendency for a species to become popular or to fall into comparative disrepute as outstanding results or the reverse become evident. The conifers which grow quickest in the early stages are Douglas fir, Japanese larch and Sitka spruce. Douglas fir grows so quickly that it is apt, especially on soft ground, to be swayed by wind when about five years old. Usually it roots firmly again only to pass through another period of instability when the canopy is completely formed. Thinned in good time it again becomes windfirm.

Japanese larch and Sitka spruce grow so much more quickly than the European equivalents, the common larch and Norway spruce, that there must always be a temptation to give them preferential treatment in selecting species. Both the common larch and Norway spruce are excellent timber trees when grown under suitable conditions and there is then no case for replacing them by the newcomers. On the other hand, Japanese larch and Sitka spruce thrive better on poorer sites and, used with discretion, are most valuable additions to our stock of forest trees.

As regards the relative value of Scots pine and Corsican pine it may be said that the former at least in the south and east of England is subject to many insect pests to which the latter is relatively immune. Further the Corsican pine produces about 50 per cent. more timber which, though not so good as Scots pine, is of sound quality when free of knots. It was thought at one time that Corsican pine, like its relative the Austrian pine, would thrive on chalk and limestone soils, but evidence is accumulating that such is not the case. The initial growth is not maintained and trees begin to die as the pole stage is approached.

Two species, both from Western America, have been in greater demand during the last five years. *Pinus contorta* (*Murrayana*), from British Columbia and selected parts of the Rocky Mountains, is a rapid starter on poor soils and is useful for filling gaps in plantations. It appears to be prone to pine tortrix in districts where that insect is common. The hemlock spruce has long been known in this country as a graceful tree but has only rarely been planted under forest conditions. It grows very quickly and measurements of a few plots show a heavy production of useful timber. It stands a great deal of shade and is being used chiefly for filling up gaps in plantations.

Two relatively new species which may become useful in the south of England are *Nothofagus obliqua* and *N. procera*. These are the beeches of the Southern Hemisphere coming from the south of Chile and the Argentine, but unfortunately seed is difficult to obtain. Samples of the timber obtained from Chile are distinctly attractive and it is believed that the quality will be at least as good as that of native beech.

As regards planting methods, reference has already been made to the turf-planting of spruces. A systematic attempt to cheapen the cost has been made by substituting seedlings for transplants. The results have been variable. When strong seedlings are used in a favourable planting season the losses are negligible and growth is good. The use of seedling conifers other than spruces has on the whole not been encouraging over the last few years. In general the most successful type of plant has been the 3-year old (2-year—1-year) transplant, but under special conditions 2-year and 4-year old transplants have done best.

As regards broadleaved species, the standard practice with oak is to use 1-year seedlings at the rate of 5,400 per acre. Large ash and sycamore plants 2 ft. 6 in. to 3 ft. high have done far better than small ones. Beech transplants 18 in. high have as a rule been used but 1-year seedlings and 2-year transplants have also been successful under certain conditions.

A good deal of direct sowing (instead of planting) has been done from time to time with curiously variable results. The chief species have been oak, Scots pine, Corsican pine and maritime pine. In the case of oak, unless mice happen to be prevalent, a good crop of seedlings can generally be counted on and as a rule the plants grow steadily; in certain parts of Northamptonshire, however, they made hardly any growth for several years on derelict agricultural land and are only just beginning to develop normally. Direct sowing with pine species on sandy heaths has also been fairly successful so far as germination is concerned but subsequent growth has been most irregular. For example, in Wareham (Dorset) it was not uncommon to find in the first spring 10-20 seedlings of maritime pine in each seed patch of about a square foot. The seedlings were from 1 to 2 in. high at the end of the second year and, while some died in the interval and a few grew normally, by the end of the eighth year many had apparently made no additional growth whatever. Nevertheless in the last two or three years great numbers of these checked plants have sprung into active growth, helped perhaps by the dry seasons. In the case of Scots pine and Corsican pine recovery has been less marked. In practically all cases the areas sown with seed of coniferous species are far behind in development those planted in the usual way with nursery transplants.

Natural Regeneration.—There are some 500 acres under natural regeneration with oak in the Forest of Dean and New Forest, where this method is adopted under suitable conditions. On the whole the stocking and growth are good. The earlier regenerations were made on the " strip " system, but this has now been replaced by the more flexible " shelter-wood compartment system ", by which the mother trees are removed, not in definite strips but individually according to the requirements of the young crop.

There are also some small areas under natural regeneration to ash, beech and pine. It is already clear that with sufficient mother trees and in the absence of rabbits there should be no difficulty in securing natural regeneration of pine woods in the south and east of England.

Thinning.—The area thinned annually in the Commissioners' woods already amounts to over 3,000 acres. Nearly all is in the former Crown woods and plantations which have been acquired. The thinning of plantations formed since 1919 is only just beginning

and will not assume considerable proportions for at least five years. Meanwhile the current routine thinnings and extensive experimental work in sample plots on thinning methods and the allied subject of pruning dead branches are providing much valuable information. It is already clear that in the case of the larches the first thinning must be made early and repeated at frequent intervals. If this is done there is little to fear, in most instances, from larch canker. In the case of Douglas fir, the first thinning should also be early for the sake of the stability of the crop.

With the pines the wolf trees, and as many as possible of the stems badly damaged by tortrix, should be removed at the earliest opportunity. The removal from the woods, or peeling, of pine thinnings with thick bark is also a measure of first-class importance in preventing damage by pine beetle.

Investigations into pruning are still proceeding, but it is probable that selective pruning will prove to be highly remunerative.

Some natural Phenomena affecting the Formation and Protection of Plantations.

Weather.

The effect of weather on planting and plantations may conveniently be considered under the conventional seasons—winter, spring, summer and autumn—although growth conditions in any one season may be affected by the character of that preceding it.

The winter season may be taken to begin with the complete cessation of growth. Plants can then be handled in the nursery, where transplanting begins, and in the plantation. Snow and frost may normally be expected to hamper these operations and, according to the severity of the local weather, work is suspended for longer or shorter periods. Planting has occasionally been prolonged further than is desirable into the spring, but provided the early-flushing trees, such as larch, are planted in good time inconvenience rather than severe loss is the result. There is no case on record, during the 15 years, of the general planting programme being seriously curtailed owing to severe winter weather.

There are practically no records of winter frost killing the commoner forest trees. Winter snow has on two or three occasions flattened out small areas of dense young Douglas fir, a loss which might have been avoided by early thinning. Wet snow is very apt to break the branches of Scots pine, especially the coarsely branching types. One effect of severe winter frost is to leave behind masses of dead surface vegetation, thus preparing the way for forest fires in the late winter or early spring.

The early spring is a critical time in the life of newly-planted trees. Usually cold easterly winds are to be expected which increase transpiration. If the winds are prolonged and the soil is already dry, the chances are that casualities will be high.

Further, the risk of forest fires is much increased. A severe winter followed by a dry spring is always the cause of great anxiety to those in charge of plantations, and if Easter, which brings an influx of visitors from the town to the country, comes early the anxiety is doubled. The worst fire years which have been experienced since 1919, namely, those of 1921, 1929, 1933 and 1934, began with spring droughts. During the six-year period 1929-34, just half the total number of recorded fires occurred in the months of February, March and April. With the exception of 1931, which may be described as a " wet year," there have been periods every year in each Division when fire danger has arisen.

Prolonged drying winds are also bad for the nursery. On the other hand, very wet springs, such as obviate risk of fire in plantations, retard some of the operations such as the preparation of seedbeds.

During the late spring and early summer some damage is always to be expected from " late " frosts. It is an exceptional year when no " frosting " is reported from all Divisions. The first late frosts may occur early in April when the young trees are just stirring into growth. Late frosts are frequent in May, common in June, and occur occasionally in July and even in August. Frosts later in the year are usually designated " early " as heralding the advent of winter.

The distribution of late frosts seems to be highly erratic. Occasionally they cover large areas, but more often they are relatively local and the effect of local factors such as topography, giving rise to the well-known phenomenon of " frost hollows." In bracken areas the fern is sometimes " browned " by frost. Frequently there is a sharp line between the browned and unbrowned bracken and the course of this line indicates how erratic can be the incidence of frost.

The damage done by late frosts depends not only on the severity of the frost, but also on the species of tree and its state of growth. Scots pine and birch are almost immune. Almost any other of the common species may be frosted under unusual conditions, but in the commonest month for spring frosts—May—the order in which damage may be expected is roughly beech—ash—oak among hardwoods, Sitka spruce—Douglas fir—Norway spruce—larches among conifers.

Serious damage done to plants by spring frosts is usually confined to those whose leaders are below the frost line. The commonest effect is to kill back the leaders and to make the plants bushy. Sometimes the plants are killed outright but more often the result is the loss of one, or more, year's growth and consequent delay to the period of establishment. Occasionally the leaders of trees 10 to 12 feet high are killed, as happened to Sitka spruce in the New Forest in 1927.

Apparently also frost damage is the forerunner of certain fungus diseases, such as *Phomopsis* on Douglas fir.

As regards the summer season, the most harmful condition is prolonged drought. The effect is felt chiefly by newly planted trees, losses among others (with the exception of Japanese larch) are usually small. It has been reported that in the successive drought years of 1933 and 1934 the growth of established trees was better than the normal in 1933. In 1934 the growth was less owing presumably to the complete exhaustion of reserves of soil moisture. In the latter year a number of vigorous Japanese larch were observed to die off.

Even in dry years, the early summer is not usually a period of great fire hazard so long as the grass remains green. When, as in 1933, the drought conditions continue into September the hazard becomes exceedingly great. Out of 621 fires recorded in that year 104 occurred in August and 125 in September. A wet summer means excessive weed growth and increased cost of weeding plantations and nurseries.

The chief consideration in the autumn season is to get the year's shoot ripened off and safe against winter frost. In mild autumns weeding is unduly prolonged and planted trees, especially Douglas fir, are apt to make a second shoot which may be cut back by early frost.

Seed Supply.

The seed supply is drawn from many parts of the world. So far as possible the Commissioners' requirements are met from home production, but it is rarely possible to meet more than a small proportion of the demand from this source. Reliance for Scots pine, oak, beech, ash, sycamore and chestnut is mainly placed in home-collected seed, supplemented in the case of sessile oak and beech by supplies from the Continent of Europe. The bulk of the Douglas fir and Sitka spruce is obtained, through the good offices of the Canadian Dominion Forest Service, from Vancouver and the Queen Charlotte Islands respectively, but occasionally additional supplies have to be obtained from Washington and Oregon. Japanese larch seed comes from Japan and Corsican pine from Corsica, Norway spruce from Germany and Austria, and European larch from Switzerland, Austria and, occasionally, Silesia. The tendency of late years has been to rely more on home-collected European larch seed and less on continental sources.

No kind of tree produces abundant crops of seed every year, though some are far more consistent than others. This variability is more marked with broadleaved species than with conifers. In either case it is a great inconvenience when working to a regular planting programme. It is met by storage, but stored seed not only loses some of its germinative power, but also the rate of germination when sown is slowed up so that some species do not come up until

the second year. The difficulty with regard to loss of germination has been largely overcome by storage in air-tight containers. Douglas fir seed kept in this way has remained good after four years. It has been found also that germination of stored seed can be speeded up by stratification in sand and early sowing.

The records of seed years, so far as details are available, are shown in the table below. Roughly it may be stated that it has been possible to secure a sufficiency of new seed to the following degree :—

Norway spruce, Scots pine, Corsican pine, European larch and oak in at least two years out of three;

Sitka spruce one out of two, Japanese larch and beech, one out of three and Douglas fir one out of four.

The problem of ensuring a continuous supply of suitable beech plants is still unsolved because the seed does not lend itself to storage.

Seed Supply.

a — abundant; g — good; p — poor; f — failed.

Species.	Year of Crop.														
	1919	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Scots pine	g	g	a	a	p	p	a	g	p	a	a	a	a	a	a
Corsican pine ...	p	p	a	a	g	f	p	a	g	a	g	p	p	a	a
European larch :															
Home	–	–	p	p	g	g	–	g	p	p	p	p	p	p	g
Abroad	–	a	a	a	f	a	f	a	g	a	g	f	a	p	g
Japanese larch ...	f	f	a	f	f	f	a	f	p	f	f	a	f	p	g
Douglas fir	p	g	a	f	a	f	f	p	f	f	f	p	p	g	p
Norway spruce ...	–	a	a	a	a	g	f	a	g	a	g	f	a	p	g
Sitka spruce	–	f	a	f	a	f	p	a	a	p	a	p	p	p	f
Oak—															
Home ...	f	f	g	a	p	a	a	g	g	g	g	p	p	g	g
Abroad ...	–	–	–	–	–	a	a	a	–	–	–	a	a	a	a
Beech—															
Home	p	g	f	a	f	a	f	g	f	p	a	f	p	p	p
Abroad	–	–	–	–	–	g	g	–	–	–	–	–	a	a	a
Ash	–	–	g	–	–	–	–	g	g	p	p	p	a	p	f
Sycamore	–	–	g	g	g	g	g	g	g	g	a	g	g	g	g
Chestnut	–	–	g	f	f	–	p	g	p	p	a	p	p	g	g

INSECTS AND FUNGI.

Each year damage is done by insects and fungi but only occasionally does this assume serious dimensions. The oak tortrix and other caterpillars defoliate oak in some parts of the country annually but as a rule the attacks die down in the course of a few years and the trees recover their vigour. Towards the end of the war prolonged attacks of oak tortrix, combined with severe infestation by oak mildew and also honey fungus, resulted in the death

of thousands of oak trees in the south of England. There has been no outbreak of similar severity since then though in the past five years different parts of the Forest of Dean have been successively attacked and in 1934 there was serious defoliation throughout the south-east of England.

Plant lice (chermes and aphids) are at times troublesome such as the green spruce aphis (*Aphis abietina*), *Chermes pini* and *Chermes cooleyi*. The last of these, which forms a woolly covering on the needles and twigs of Douglas fir, is the most persistent and widespread. It checks the growth of attacked trees quite considerably but is not known to have caused any actual deaths and as a rule growth is resumed after a period of a few years.

The pine sawflies (*Lophyrus* spp.) have from time to time caused extensive defoliations in pine plantations, especially at Rendlesham in 1926. The outbreak there appeared to be assuming dangerous proportions and crushing by hand was resorted to as a means of control. This was not effective but the outbreak came abruptly to an end from natural causes. The pine sawflies appear to be quickly controlled by biological agencies and the procedure now is to let the attacks take their course.

In certain nurseries cockchafers have done much damage especially the small garden chafer *Phyllopertha horticola*, and no satisfactory means of controlling them has yet been found. Honey fungus is common in coniferous plantations on felled hardwood areas causing gaps here and there which are somewhat troublesome though fortunately these seldom assume serious proportions. Other insects and fungi are discussed in more detail in the section dealing with research and experiment.

Damage done by Animals.

Deer.—Deer naturally seek the seclusion of large areas of plantations where they can remain comparatively undisturbed. In the typical deer forest country special fencing is erected to exclude red deer but roe deer frequently find their way through. In other districts where deer are not very numerous, for example, Cannock Chase (fallow deer), fencing has been dispensed with and the deer have been controlled by shooting. Deer also turn up unexpectedly in places where they were not known to exist, having escaped, presumably from private deer parks.

The damage which deer do by browsing, rubbing and peeling young trees is considerable. In particular it becomes almost impossible to get trees established in backward gaps in plantations. The Commissioners are left with no alternative but to reduce the numbers to a point which ensures the safe development of the plantations. They are aware that there is a certain amount of sentiment against killing deer; in some cases because people regard them as beautiful inoffensive creatures; in other cases because it

is almost impossible, without resorting to high velocity rifles, to ensure that occasional wounded deer shall not escape. To guard against this, use has been made as far as possible in the Midlands and south of England of New Forest keepers who have exceptional skill in killing deer. The Commissioners have sometimes been blamed for the killing or wounding of deer with ordinary shot such as would be used by farmers or gardeners.

Rabbits.—Of all the pests with which the forester has to deal the rabbit is the most annoying. The net cost of the animal to the country, after due allowance has been made for food values, must be enormous. Wire netting and the destruction of rabbits in enclosures is a routine measure on the Commissioners' areas, but even so constant vigilance is required. Reports which have come in from various quarters show that the dry years 1933 and 1934 were very favourable to rabbits and the cost of protective measures has increased.

Voles.—The field vole, *Microtus agrestis*, is one of the most troublesome of the intermittent pests of young plantations. As a rule, these creatures are quite inconspicuous members of our small fauna but every now and then for reasons which are not wholly understood they increase enormously in numbers and a plague develops. Two such plagues occurred in the last century, one in 1814 in southern England—which incidentally coincided with the reafforestation of the Forest of Dean and caused immense damage to the young oak plantations—and another in 1890 to 1892 in the Lowlands of Scotland. During the present century there have been no plagues on the same extensive scale but numerous local outbreaks have done much damage in afforestation areas. To some extent at least the conditions present in a large block of land in process of afforestation favour the occurrence of vole outbreaks, as the removal of grazing stock encourages a rank growth of grass and other vegetation and so provides a superabundance of food for the voles, which enables them to breed in very large numbers. Such outbreaks have occured at more or less regular intervals in the Cowal Peninsula of Argyllshire, at Lake Vyrnwy in North Wales, in the Border Country near Newcastleton and in other districts. The most serious of these have been in the Cowal Peninsula where the Commissioners have large areas under afforestation (Benmore, Glenbranter, Glenfinart and Ardgartan Forests). In this district there have been peak years in 1922, 1926, 1929 and 1932. In each case the principal damage took place in the winters preceding the peak. In the spring of 1932 the ground was virtually alive with voles, all the grass and rushes were eaten and the hillsides had a curiously brown appearance throughout the early summer owing to the killing of the vegetation. At the same time extensive damage was done to thriving spruce plantations up to six feet in height although trees up to twelve feet high have also been attacked. The damage is of three types, to the shoots, to the bark at the

base of the stem and to the roots. In the first of these a tree which is slightly attacked may have only a few of its lower branches eaten off, but it is not uncommon to find newly planted trees nibbled down until nothing is left but a stalk a few inches high. In the second form of damage the bark is eaten off at the base of the stem, sometimes in a ring round the stem when the plant is almost invariably killed, but often only partially when the plants usually recover. In cases where the roots are attacked these are either girdled or severed completely near the root collar; on the whole this form of damage is less widespread than ringing or shoot nibbling but trees so attacked are usually blown over and die. All three types of damage frequently occur in the same plantation though seldom on the same tree; as a rule shoot nibbling is most common in plantations of one or two years old, ringing and root damage in older plantations. All species are liable to attack and damage occurs on every type of land but is probably worst on the wet rush-covered areas.

Fortunately vole outbreaks come to an end even more suddenly than they arise and for this two factors seem to be responsible, the food supply tends to run short, and an epidemic disease attacks the voles which virtually wipes them out in a single season. It is a curious fact that only rarely are the dead bodies or skeletons of voles encountered. Various methods of artificial control have been tried to reduce the numbers in the peak years including trapping, poisoning and the use of virus, but without any material effect upon the overwhelming numbers of the pest. The natural enemies of voles—weasels, owls and hawks—tend to increase in numbers when an outbreak occurs but their increase is slow compared with that of the voles. A possibility now being investigated is the spread of the natural epidemic, the cause of which has recently been identified, but the technical difficulties to be overcome are very considerable.

Education.

As explained in the Tenth Annual Report provision in forestry education has to be made for students qualifying for posts as forest officers; landowners and landagents, and foresters. For the first of these categories instruction has been available at Oxford, Cambridge, Bangor, Edinburgh and Aberdeen. In 1933 the Forestry School at Cambridge was closed but teaching in estate forestry was continued. These Universities each received for the greater part of the fifteen years £500 per annum with the exception of Edinburgh University which is separately endowed.

The average attendance of forestry students at the Universities was approximately 160 per annum and in the fifteen-year period some 524 degrees and 222 diplomas were awarded. An average of 50 students have qualified for the forest services each year but the number of vacancies under the Forestry Commission and Colonial Office has averaged only fifteen per annum; during the

past five years (1930-34) recruitment in these services has been at the rate of only eleven per annum as compared with 49 men graduating each year at the Universities.

Short courses in forestry have been available throughout the period under review at Armstrong College (Durham University) and at the Edinburgh and East of Scotland College of Agriculture, and since 1934 a grant from the Commissioners has enabled the Royal Scottish Forestry Society to provide evening lectures in the subject at several centres in Scotland. In addition forestry education is obtainable at a number of Agricultural Colleges and the Surveyors Institution conducts special examinations in forestry.

The Imperial Forestry Institute which was established at Oxford in 1924 for postgraduate instruction, the training of research officers and the provision of courses for selected officers from the forest services of the Empire, has been principally maintained by the Colonial Office and the Commissioners. The contribution from the Forestry Fund has averaged about £2,000 per annum. The Institute has been attended during the ten years since its inauguration by 274 students. These comprised 104 post-graduate probationers (Great Britain 5, India 8, South Africa 6, Colonial Services 85); 149 forest officers on leave (Dominion Services 16, India 36, Colonial Services 97), and 21 private students.

Apprentices' Schools.—During the past fifteen years 446 forest apprentices (including 17 Cypriots who attended by arrangement with the Government of Cyprus) have been trained at the Commission's Schools; 332 have received certificates and 264 have been given employment by the Commission. The Apprentices' School for England and Wales is situated at Parkend in the Forest of Dean and that for Scotland at Benmore in Argyllshire.

Research and Experiment.

It will be convenient to consider the progress made during the past five years under the five categories into which the problems were grouped in the Commissioners' Tenth Annual Report.

Production of Timber under varying Conditions.—The development of different types of forest crops is traced out in detail by means of permanent sample plots which are remeasured at short regular intervals. Such studies are of especial importance in the case of what may be termed the minor species whose place in afforestation work in this country is not yet fully established. During the past five years more than 170 sample plots have been remeasured and 37 new plots established. Lawson cypress, *Cupressus macrocarpa*, hybrid larch, and black Italian poplar are interesting species newly investigated. While in the main the sample plot work has been concerned with growth factors and volume production the question of quality has not been overlooked. In timber, quality is more dependent upon freedom from knots than upon any other single factor and the complaints raised in the past against the knotty

character of our home-grown timber have been to some extent justified. This is a problem which is receiving the close attention of the Commissioners and has led to a study of methods of pruning in young plantations. A comprehensive scheme of investigation is in progress, in cooperation with the Forest Products Research Laboratory, and a considerable amount of information has already been collected on the technique and cost of pruning.

Establishment of Plantations.—The work under this head falls into two subdivisions, the raising of plants in nurseries, and planting. The importance of the forest nursery in the general scheme has certainly not diminished during the period under review and the Commissioners besides pushing on with experimental work are also encouraging research of a more fundamental character. Grants have been made in aid of work on the mycorrhiza of forest trees and also for an investigation on the root development of European larch. Some of the results obtained in the course of the nursery experimental work are of interest. By stratification of Douglas fir seed, that is mixing it with an even bulk of sand and storing it out of doors, germination becomes double that of seed stored dry over the winter. A curious feature of this method is that the seed must not be stratified earlier than the month of January if a good result is to be obtained.

The method of covering small seeds such as larches and Sitka spruce is another part of nursery technique to which much attention has been given. By using coarse silt-free sand in place of nursery soil for covering the seed after sowing the germination can often be greatly improved, thus the output of Sitka spruce seedlings, in particular, has in several experiments reached over 90,000 seedlings per pound of seed as compared with a normal yield of 30,000 to 50,000 plants.

The benefit of early sowing of such species as Sitka spruce, Japanese larch and *Pinus contorta* has been clearly demonstrated in experiments carried out near Oxford. Not only has early sowing (before the end of March) greatly increased the yield of seedlings but also the size of one-year plants has been doubled compared with plants raised from seed sown later in the spring.

Grading experiments with conifer seedlings have brought out very clearly the superior quality of the larger and stronger plants. When the seedlings were lifted and classified into three grades, Grade I including the tallest and Grade III the smallest and poorest plants (culls), the losses following lining-out in the nursery were progressively higher from Grade I to Grade III in all the seven species investigated. The yield of usable transplants from Grade I seedlings was from 50 to 100 per cent. greater than from Grade III. The experiment has been carried a further stage and plots established in a number of forests. In course of time these plots will enable conclusions to be drawn as to the relative value of the planting stock produced from the several grades.

On the plantation side of the work the field plots on peaty soils are beginning to yield information of considerable importance; in particular the extent of really intractable ground of a peaty type is proving considerably less than it was formerly believed to be. Good progress has been made with the classification of the peat soils and the value of small initial applications of basic slag on certain of the marginal types is now becoming apparent. Intensive drainage and the now universally adopted method of turf planting are essential preliminaries in afforesting this class of ground. The upland calluna heaths are other types of land on which much experimental work has been done. Here the greatest progress has been achieved by cultivation, usually with heavy tractor-drawn ploughs, and on some of the poorest soils basic slag is proving of value in aiding the establishment of the more exacting species of conifers. Mention was made in earlier reports of experiments on the establishment of oak on heavy soils in the Midlands and south of England, and here again satisfactory progress can be reported. Most of the difficulties have in fact yielded to a combination of careful tending and patience, the latter being perhaps the most important. Other types of ground which are responding to treatment include the chalk downs of the south of England and lowland heaths in Dorset and in East Anglia.

The types already mentioned are only samples of the wide range of soils on which afforestation is being carried out, and the need for a more detailed investigation of the characters of natural as opposed to cultivated soils has become increasingly apparent. With this end in view the Commissioners have recently made arrangements, with the Macaulay Institute, for research to be carried out on some of the soils now being brought for the first time under trees.

Treatment of Established Plantations.—The stage at which thinnings should begin and the intensity of thinning raise many technical problems which are best studied by means of comparative series of sample plots: of these a considerable number are now under regular supervision. The recent introduction of the principle of replication into this work is an important development and one which should add materially to the reliability of the results.

Protection.—The co-operation of the Farnham House Laboratory, a branch of the Imperial Institute of Entomology, has been secured for a comprehensive investigation of those enemies of conifer plantations the pine beetles and pine weevils. The beetles in particular reduce the value of pine woods by destroying the leading shoots thus rendering the thinnings unsuitable for sale for telegraph poles, a market which the Commissioners are anxious to develop as much as possible. By a careful study of the pests and their predators and parasites it is hoped to develop a system of biological control which will reduce the damage to small proportions and at the same time do away with much of the expenditure on artificial control measures,

trapping, etc. The pine shoot moth whose larvae tunnel the buds of young pine trees is another pest which has received a considerable amount of attention. Various methods of artificial control have been tried but so far these have failed where the attacks have been severe. Fortunately investigation has shown that the trees have a strong power of recovery, and that an attacked plantation, which may look alarming when the damage is at its height, in a few years time will as a rule resume an almost normal aspect. It is interesting also to note that Corsican pine is comparatively immune from attack and can therefore be substituted for Scots pine in badly infested areas.

Among the more important fungal diseases investigated are three which attack broadleaved trees, namely elm disease, ink disease and oak heart-rot. The development of the elm disease has been followed by means of annual surveys; apart from restricted areas the amount of damage done is relatively slight and so far is not such as to disturb materially the amenity of the country-side. Ink disease is caused by a root fungus attacking the sweet chestnut and, in minor degree, the common beech. It has only recently been recorded in this country but is rather serious in parts of France. It appears to be most severe on badly drained soils. The oak heart-rot is caused by a fungus which spreads from large dead branches into the heart wood of the main bole and is of some economic importance in certain types of oak woods. The rot is in large measure a result of faulty silviculture in the past and should not be troublesome in our future oak forests. Of coniferous diseases two, which cause needle cast, may be mentioned. The one on Douglas fir known as *Rhabdocline pseudotsugae*, appeared at one time somewhat alarming, but is now known to attack seriously only the intermediate and blue forms of Douglas fir while the faster growing green form is virtually immune. The other fungus, *Meria laricis*, brings about the needle cast of European larch and is a troublesome disease in nurseries; fortunately it has been found to be amenable to control by spraying with sulphur.

Besides the direct study of parasitic diseases a considerable amount of time has been given to the question of frost injury and its relation to disease. This subject has been studied at Oxford and it has become clear that frost plays a much more important part in the formation of cankers than was at one time appreciated.

Utilisation.—The technical properties of the home-grown timber of such trees as Corsican pine, Douglas fir and Sitka spruce, species which the Commissioners are planting extensively, are under investigation by the Forest Products Research Laboratory at Princes Risborough. The provisional results are encouraging especially in the case of Corsican pine which appears to share many of the good properties of Scots pine timber. In the matter of straightness it is usually superior to Scots pine and its suitability for use for telegraph poles or for carrying transmission lines is now under enquiry. The

disposal of the small poles produced from the thinning of young conifer plantations is receiving the careful attention of the Commissioners in collaboration with the Forest Products Research Laboratory.

Special Services.

Empire Forestry.—In connection with the Imperial Conference, London, in 1930, a special Committee was appointed to report on forestry in the Empire. Particular stress was laid on the desirability of improving the existing facilities for instruction and research in forestry.

As mentioned in the Tenth Annual Report the fourth of the series of British Empire Forestry Conferences was due to take place in 1933. Owing to the prevailing economic depression postponement proved advisable but at the invitation of the Union Government arrangements have now been completed for holding the meeting in South Africa next September.

International Union of Forest Research Organisations.—The Commissioners received the Permanent Committee of this Union in 1931 and afforded facilities for the inspection of forests and the examination of the research work of the Commission.

Statistical Enquiries.—Statistical data relative to the forest resources of the Empire with special reference to Great Britain's timber supply have been revised from time to time. With the assistance of private landowners who were good enough to supply detailed information of their estates, a census of production of home-grown timber was compiled showing the position for 1930. The report containing the census figures was published in 1932.

Publications.—There have been issued during the fifteen years, 15 Bulletins, 17 Reports and 21 Leaflets; nearly all the leaflets have been revised and reprinted. The Commissioners have also issued publications in connection with the Empire Forestry Conferences including a number of papers on technical subjects. A list of the publications issued to date by the Forestry Commission is given in Appendix III, page 101.

Consultative Committees.—Forestry Consultative Committees for England, Scotland and Wales respectively were established by Order in Council in 1920. The members hold office for three years and a number of them have served on the Committees for fifteen years. During that period the English Committee have held 34 meetings, the Scottish Committee 21 and the Welsh Committee 29. Thirty-two formal references have been submitted to the Committees for their advice and assistance, the greater number during the first ten years of the Department, while forty-seven other subjects have been considered by one or other of the Committees. The Commissioners take this opportunity of thanking members for the careful consideration which has been given to questions placed before the Committees.

Miscellaneous.—The Commissioners have prepared forestry exhibits annually for use at the principal agricultural shows.

Forest Workers' Holdings.

The systematic establishment of forest workers' holdings was not part of the Acland programme and was not adopted until 1924. From that date until 1931 it was essentially a scheme of land settlement, though useful in the planting and protection of the forests. Since 1931 the land settlement aspect has receded into the background and the creation of new holdings has been restricted to such as are essential to the proper working of the forests.

The original scheme defined a forest worker's holding as a cottage and outbuildings with not more than 10 acres of agricultural or cultivatable land; the tenancy to be short period (renewable) and the holders to be guaranteed a yearly minimum of 150 days' work in the forest, the remainder of their time being available for working the holding or for additional forest work. The number of holdings was to be limited to 5 per 1,000 acres of plantable land and the rate of planting so adjusted in each unit that by the time the whole area was completed new work would be available for the holders in connection with thinnings. It was hoped in this way that the settlement of the holders would be of a permanent character.

In spite of the fluctuations which have taken place in the Commissioners' planting programme there has been very little deviation from the first intentions. A few holdings have had to be changed to ordinary tenancies owing to lack of forest work, but over 90 per cent. of the total holdings still fulfil the original conditions.

The total number of holdings established to September 30th, 1934, was 1,233, of which 618 were in the first decade and 615 in the last five years. The greatest number established in any one year (1931) was 264. At present the rate is approximately 30 per annum.

Yearly details of expenditure and income are given in Table L (p. 90), from which it will be seen that expenditure has amounted to £704,689 and income to £104,715. The average cost of establishing holdings has been £504, of which land accounts for £70, and the cost of buildings, water supply, etc, £434. These average figures are swollen by the high cost of holdings in isolated districts and reduced by the low cost of re-conditioning existing holdings on newly acquired land. The average rent charged per holding is £14 9s. After allowing for repairs, depreciation, cost of management and the like, the average net income is £1 15s. per annum per holding representing a net return of 0·4 per cent. on the capital invested. There is consequently a loss on the actual holdings. Part

at least of this should be indirectly recoverable because the holdings will provide a valuable nucleus of forest-minded workers when the time comes to thin the forests and to utilise the produce.

The information contained in the following statement indicates the way in which the holdings have been utilised, the estimated value of live stock, etc.

Number of forest workers resident on the holdings	1,176
Total number of residents on the holdings ...	4,978
Average annual rent of house, outbuildings and land	£14 9s.
Average area (including outrun)	11 acres
Head of live stock :—	
Horses	441
Cows	995
Other cattle (including calves)	1,061
Sheep ...	4,374
Pigs ...	2,264
Poultry	55,504
Miscellaneous (including goats)	1,068
Estimated value of the live stock ...	£43,173

It may be stated that as a land settlement scheme the forest workers' holdings have been successful. That this is so is shown by the facts that there have been comparatively few changes in tenants and that there has been no difficulty in re-letting vacant holdings. As an experiment some 75 miners from what are now known as the Special Areas were placed in 1929-31 in forest holdings. Without any injustice to the men, it may be said that on the whole they have not flourished in their new and strange environment. The success or failure of a forest holder is dependent on a number of factors. If the man and his wife are both country people used to land work, half the difficulties vanish and the holding becomes a valuable supplement to the cash wages received from the forest. At the other extreme some men are content to occupy a holding merely because it provides a cottage conveniently situated as regards the forest work.

The figure already stated indicates that, as a whole, the holders, most of whom started with no capital, now own live stock to the value of £43,173.

Utilisation of Home-grown Timber.

During the last few years the Commissioners have given increasing attention to the utilisation of home-grown timber, from the point of view both of the disposal of produce from existing woods and also of the promotion of forestry in general.

At the present time the amount of home-grown timber cut in the forests under the charge of the Commissioners is not large compared with the total felled in the country. Sales of forest produce have averaged £54,680 per annum over the last five years, whereas the total value of home-grown timber felled for sale or estate use was estimated in 1930 to amount to £1,545,340. At the same time it is clear that the proportion of State-owned timber sold must gradually increase. As regards private forestry, the economic basis of silviculture is obviously the remunerative disposal of timber. Owners of private woodlands cannot be expected to replant unless there is a reasonable prospect of profit.

For these reasons the Commissioners appointed an Inter-Departmental Committee in December, 1931, " to investigate and submit proposals for improvement in the utilisation of home-grown timber."

The Committee presented in 1933* a Report summarizing its preliminary survey of the position. It was pointed out that the post-war neglect of private forestry had also spread to the marketing of timber. The Committee stated that apart from some notable exceptions " There is very little appearance of any method under the present system or want of system. On most estates there is no rule for sale except immediate demand for money. Timber is placed on the market intermittently; no merchant can predict what timber he can obtain six months ahead of requirements and consequently he is unable to make forward contracts. Much damage is done by owners selling their timber by block without ascertaining, by correct measurement, the volume for sale. In most cases the price per cubic foot is consequently very small; this causes confusion in the market and depresses prices for those endeavouring to manage their woodlands at a reasonable profit." And also, " Now that estates are diminished in size few individual estates can offer a steady supply to any one trade. To overcome this difficulty estates should market their timber through a central organisation in touch with various trades using wood, and guarantee a regular supply." The Committee believed " that with adequate organisation and some measure of protection there should be a greatly increased use of home timber, employing some thousands of men and replacing a part of the imports from foreign countries."

As this note is concerned chiefly with the question of the organisation of the home timber industry, the reader is referred to the Committee's report for further details.

A movement had already been started, in 1932, by the owners of woodlands to organise the marketing of timber on co-operative lines, and in January, 1934, the Home-grown Timber Marketing Association was set up with Headquarters in London and branches in various parts of England and Wales.

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* *Interim Report of the Inter-Departmental Home-grown Timber Committee, 1933.*

In February, 1934, a deputation from the home timber industry was received by the Financial Secretary to the Treasury. Its object was to draw attention to the depressed state of the industry and to enlist Government assistance. The question of more efficient organisation was again stressed by the representative of the Government.

In November, 1933, a National Timber Conference was convened at which were represented the owners of woodlands, the timber merchants and representatives of the various Associations and Institutions interested in the question. In May, 1934, a Sub-Committee was asked to work out a definite scheme and in February, 1935, produced proposals for setting up a National Home-grown Timber Council, the functions of which would be to concern itself with propaganda, economics, statistics and trade information, and also a limited amount of research other than that which would normally be undertaken by the Forest Products Research Laboratory, Princes Risborough. The Council which would not engage in any commercial transactions should have an independent Chairman, nominated by the Forestry Commissioners after consultation with the interests concerned, and should regulate its own procedure. The Sub-Committee recommended the following consitution (apart from the Chairman) for the Council:—

1 representative of the Forestry Commission.
1 representative of the Forest Products Research Laboratory.
2 English timber growers.
2 English timber merchants.
2 Scottish timber growers.
2 Scottish timber merchants.
4 users of English or Scottish timber, e.g., an architect, a railway official, a colliery representative, a representative of the building trades.

This Council is now in course of formation. The Commissioners have undertaken to provide towards its expenses a total sum of £7,500 over a period of three years on the condition that the other interests provide not less than £500 per annum.

The Commissioners have undertaken to subscribe what may be considered an unduly high proportion of the sum needed by the Council because they appreciate the initial difficulty of financing an organisation of this kind, which has not yet had an opportunity of proving its practical value. They consider, however, that at the end of a three years' trial the disparity between their contribution and that from other sources should disappear.

The difficulties in the way of organising the efficient utilisation of home-grown timber should not be lightly estimated. There is an enormous market for all kinds of forest produce and consumers are not unwilling to buy suitable home-grown material; on the other hand reliance for the great bulk of the timber consumed

must rest on imports which, fortunately for industry, are readily available in sufficient quantity and of good quality at low prices.

Ministry of Labour Instructional Centres and Camps.

In 1926 a residential farm training centre was established by the Ministry of Labour at Weeting near Brandon, Suffolk (adjoining the Commissioners' Forest of Thetford Chase) for training unemployed men for overseas settlement and " handy " men for home employment. The course was at first of six months' duration but later was reduced to 16 weeks. In 1928 camp sites and other facilities were provided in Thetford Chase for three training centres (at High Lodge, West Tofts and Cranwich) and five centres were also established on, or in close proximity to, the forest units of Shobdon (Herefordshire) ; Presteigne (Radnorshire) ; Fermyn (Northamptonshire); Swanton Novers (Norfolk), and Bourne (Lincolnshire). Each centre accommodated about 200 men.

In 1930 the training for overseas was discontinued and there emerged the Ministry's present training scheme whereby unemployed men from areas of heavy and prolonged unemployment are given a three months' training course to develop physical fitness.

In England and Wales 25, and in Scotland three, centres and camps have been established on or near land belonging to the Commissioners, who have been concerned mainly with the provision of different types of manual work for the trainees. The work provided is such as would not for economic reasons be undertaken at present. It includes clearing sites for forest roads, quarrying stone and laying road foundations, the building of bridges and culverts, land drainage, scrub clearing and grubbing roots. There are standing arrangements for calling for volunteers among the trainees to assist the Commission's staff to control and extinguish forest fires. Consideration is being given to the establishment of additional centres.

Sites and plans for the accommodation of the men, and schemes of work are arranged between the Commission's Divisional Officers and representatives of the Ministry of Labour, subject to approval by the respective Assistant Commissioners. Forest Officers and Foresters co-operate with the Centre Managers in making preliminary arrangements but the latter are responsible for the execution of the work specified by the Commission and for the maintenance of discipline. Surveys for forest roads are carried out by the Commissioners' staff.

Further information regarding the centres will be found in the Annual Reports of the Ministry of Labour.

National Forest Parks.

Attention has already been drawn (p. 20) to the large areas of unplantable land which the Commissioners have acquired in connection with afforestation operations. For the most part such land

consists of hill or mountain which is too exposed, or, for other reasons, incapable of producing an economic crop of timber. As a rule, also, it has little other economic value except occasionally for summer grazing of small numbers of sheep or for rough shooting. On the other hand, some of the elevated areas which have been acquired are situated in parts of the country which are attractive to summer visitors. Access to ramblers and the preservation of the amenities are consequently of importance to the general public.

Powers to make bye-laws and generally to regulate the access of the public to Forestry Commission properties were taken in the Forestry Act, 1927. The need arose primarily in connection with the management of the ancient Royal Forests, New and Dean, but it was realised also that the time might come when it would be possible to admit the public to the newly planted areas. It was felt that the over-riding consideration was to keep the plantations safe from damage from fire but that as the trees developed and were thinned out the risk would gradually diminish. Incidentally, it may be stated that that stage has not yet been reached in any of the plantations made since the war.

Interest in the countryside and the preservation of its distinctive character and amenities has increased greatly in the last few years and has shown itself in the Commissioners' work, for example, in the demand for more extensive planting of hardwoods. It would appear that greater accessibility, brought about by the increase of private motor cars and public motor conveyances, is bringing yearly increasing numbers of people to the countryside.

The Report of the Committee on National Parks, 1931, also stimulated public interest in the whole question and, although no National Parks have as yet been established, that interest has not diminished but on the contrary has increased.

During the last three years the Commissioners have been giving facilities on a small scale to the Youth Hostels Associations. Surplus buildings and sites have been let to the Associations with the understanding that admission to the Commissioners' property entailed corresponding respect for it. During the summer of 1934, there were twelve hostels on Commission areas scattered as widely apart as Dartmoor and Ratagan (Ross-shire).

That still wider recreational use might be made of the unplantable land has become apparent in the course of managing the New Forest. This area more nearly conforms to the general conception of a National Park than any other area in Great Britain, and it is unique also in that Statutory provision is made in the New Forest Act, 1877, for the preservation of the amenities of the woods. It may be of interest consequently to describe the area in some detail.

The area within the perambulation of the New Forest is approximately 92,000 acres and includes two towns (Lyndhurst and Brockenhurst) and a number of villages and hamlets. The area with which the Commissioners are concerned is approximately

65,000 acres, the remainder being private property. Apart from relatively small areas of agricultural and residential property, the 65,000 acres include about 17,000 acres of inclosures and freehold woodlands used primarily for the production of timber, but subject also to considerations of amenity, and 7,000 acres of uninclosed woodlands and 40,000 acres " open " forest. The open forest is typical heathland; it is grazed by commoners' cattle and ponies and also provides rough shooting. There is a Court of Verderers which exercises certain statutory powers and duties. The public are interested mainly in the open forest and uninclosed woodlands, to both of which they have practically unlimited access. They are interested to a lesser extent in the inclosed woodlands to which in theory they have no rights of access. Nevertheless the gates are not kept locked and there is considerable freedom to the public provided no fires are lighted and respect is shown for the plantations.

Wide use is made of the forest for sport of various kinds. Riding is enjoyed all over the forest, hunting with three packs and shooting and fishing under special licences. There are three golf courses on the open forest and nearly every hamlet has a football or cricket pitch. Bivouacs are provided for hikers and others.

Although the New Forest is not a sanctuary the bye-laws are designed to protect both the natural fauna and flora. Certain creatures have to be kept in check for the protection of plantations or game, but none is ruthlessly exterminated. Contrary also to the rather widespread view the Forest abounds in birds, and several species commonly believed to be extinct still thrive there.

There are no means of estimating the number of people who visit or use the New Forest in the course of the year, but certainly there must be many tens of thousands. For campers alone some 800 to 900 permits are issued annually.

The sketch map facing page 50 has been coloured to show the economic woods (inclosures), light green, the open forest to which the public have access, dark green, and private and agricultural lands, white, to which they have not.

The New Forest has attained its present measure of popular esteem, partly, of course, by reason of its situation and natural features, but mainly because it has survived from the spacious times of Norman England with comparatively little alteration in its main characteristics.

Of all the numerous ancient Royal Forests only two, Dean Forest and New Forest, have survived, haphazard, in a form which affords opportunities for both timber production and public recreation. It appears to the Commissioners that by taking a little thought and possibly incurring a little additional expenditure in the utilisation of the land acquired for the new forests it may be possible to provide, for the future, areas as highly prized by the public as is the New Forest to-day.

It is interesting, therefore, to compare with the sketch map of the New Forest another (facing p. 51) prepared on similar lines for part of the large block of land (Kielder) which is being afforested in the Border Country. The greater part of the light green will ultimately become plantation and the dark green, which is higher ground, will remain bare of trees. The small area of agricultural land, white, is situated in the valley bottoms.

In order to ascertain what may usefully be done in such cases the Commissioners set up in 1935 a representative Committee, under the Chairmanship of Sir John Stirling-Maxwell, to investigate a specific area. That selected comprises the forests of Benmore, Glenbranter, Glenfinart and Ardgartan, which are situated in the County of Argyll.

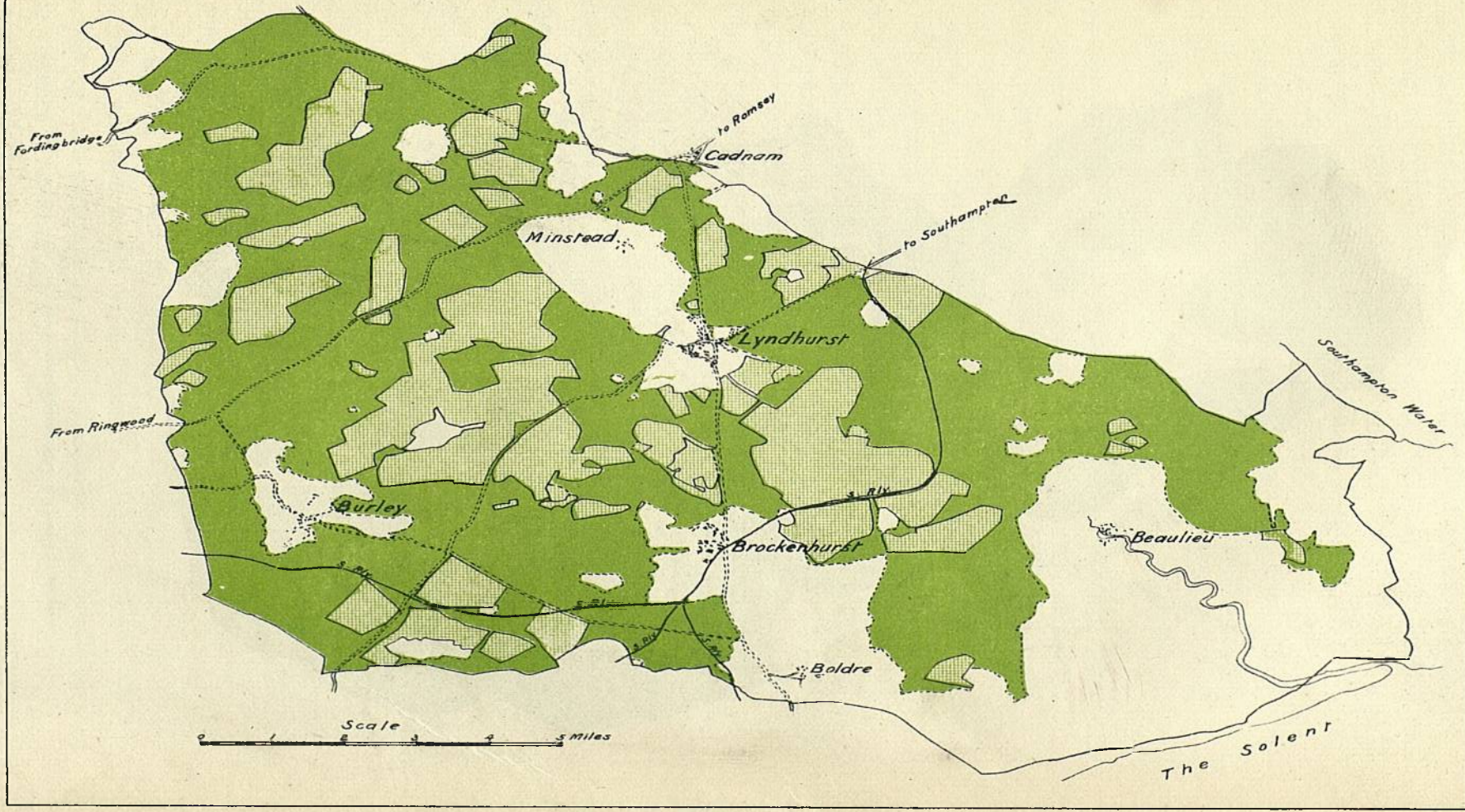
Hardwoods, Conifers and Amenity.

In 1929, in response to the criticism that afforestation was being directed too much to the production of softwoods and too little to hardwoods, the Commissioners issued a considered statement, entitled " Production of Hardwoods ", reviewing the whole position. In the interval public interest in the subject has continued to grow and one aspect of it, the relative amenity values of broadleaved trees and coniferous trees, has received particular attention. Another aspect, the desirability of introducing exotic trees into the British landscape, has also given rise to some controversy.

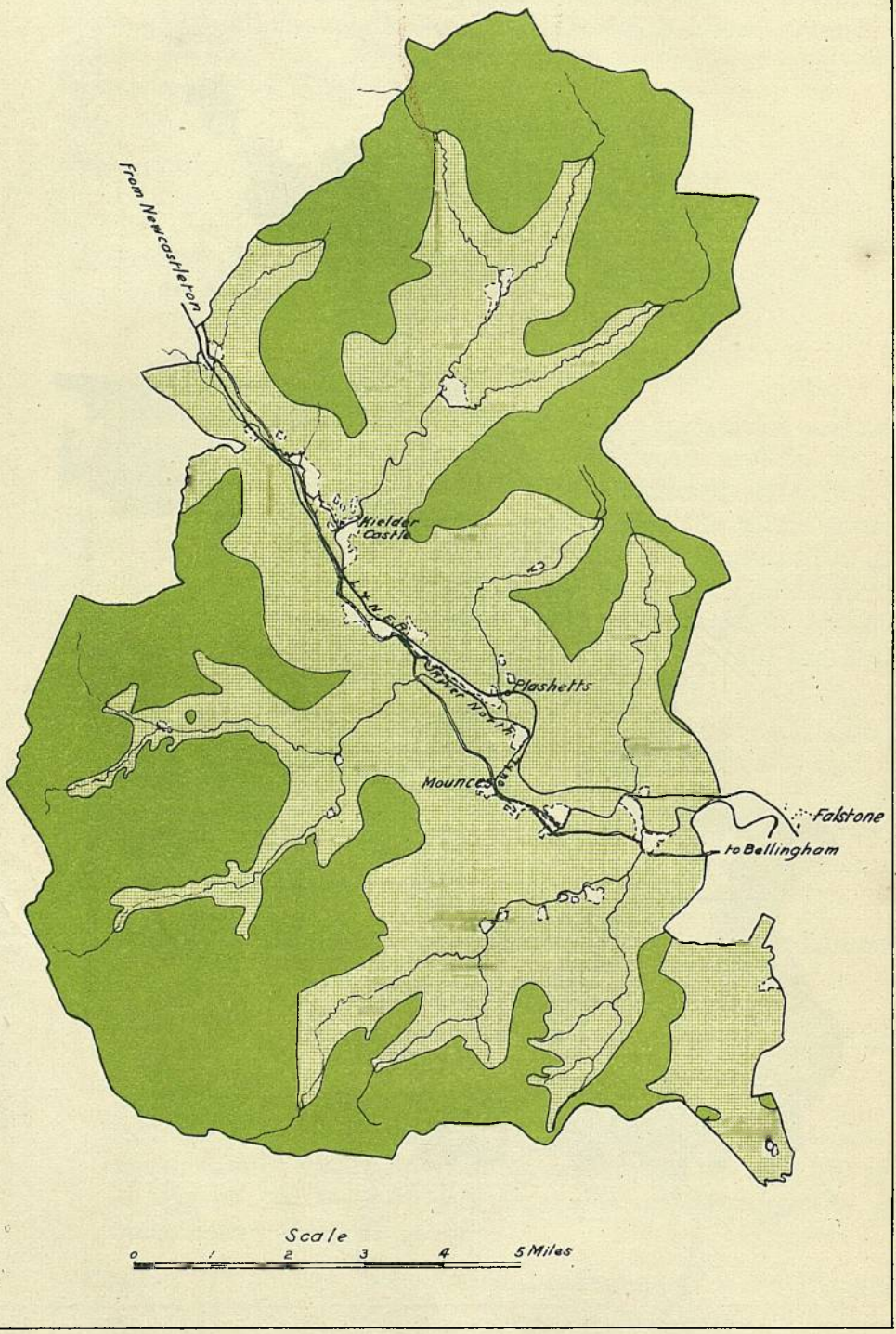
It is thought that a convenient beginning may be made with the 1929 statement, which deals with the question from the economic point of view. This is printed in full as Appendix II (p. 97). Briefly, from the economic point of view, the competition between planting conifers and planting hardwoods may be summarised in the following way :—

> At least 90 per cent. of the ten million tons (approximately) of timber used annually in Great Britain consists of softwoods. The proportions were much the same in the Great War when recourse had to be made to home-grown timber. Conifers are far less exacting as regards soil and general environment than broadleaved trees, they grow more quickly, the thinnings removed for the improvement of the final crop are more readily saleable, and, finally, by coming to maturity in 60 to 100 years as against 120 to 150 years for broadleaved trees, they give much better financial yields.

Passing to a general consideration of the subject it may be stated that the land which is available to the Commissioners for afforestation belongs to one of three types : it may be rough mountain and heath land (for the most part), devastated woodland, or derelict arable land. The first type in the main is suited only for growing conifers, at least as the first crop. Small selected areas may sometimes be planted with hardwoods, but even so it is often necessary to



The New Forest, Hampshire (see page 49).



Kielder, Northumberland *(see page 50).*

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plant with them coniferous nurses which are subsequently removed. The devastated woodlands have hitherto proved very costly to plant with broadleaved species owing to excessive weed growth. On the other hand, methods have gradually been improved and an increasing proportion of such land is in fact being replanted with beech, oak and ash. Derelict agricultural land, and especially that of a heavy character, is, as a rule, the type most suited for broadleaved species. The difficulty is not, as is sometimes stated, a question of price per acre but rather of reluctance to place under trees land which may be required for food production. It is difficult to draw a sharp line, but the general policy of the Commissioners is not to afforest land which is, or has recently been, under the plough.

As an argument for planting broadleaved trees, it has been implied in one quarter that pure coniferous woods are unnatural and bound to end in great disappointment, and the German forests have been cited as an actual example. Such a statement is far too sweeping. It is true that in certain parts of that country and with certain species, e.g. with the spruce in Saxony, disappointment has followed the extension of pure conifers beyond their natural habitat and that, since 1886, in accordance with the teachings of Karl Gayer, a proportion of broadleaved species has been introduced into conifer regenerations wherever that can be done. Such procedure is a natural development in the treatment of established forests. To attempt it on land where forest conditions have not yet been established is another matter altogether. The generalisation also overlooks the magnificent stands of timber which have been produced in Germany by the older methods.

It is dangerous to make comparisons with regard to vegetation without full knowledge of the factors which govern growth. The climatic conditions in Britain and in the greater part of Germany exhibit the differences between an insular and a continental climate. It so happens that the forests of Western America growing under climatic conditions most similar to our own are pure coniferous forests. There the primeval forests of Douglas fir, Sitka spruce, etc. are, or were, the most magnificent forests in the world. In them broadleaved species are so rare that it is incredible that they have contributed anything to the success of the conifers.

The Commissioners take great care to secure that the choice of species shall be based so far as is humanly possible on observed facts, that is that those kinds of trees shall be planted which, on the evidence of existing or former plantations, should produce a healthy crop of mature timber. To provide the basic data a great number of measurements were made of plantations felled during the war, numerous sample plots have been established and kept under observation in various parts of the country, and investigations are made from time to time into any interesting plantations which come under the axe.

Broadly these investigations prove that under suitable conditions a number of conifers can be successfully grown in a pure crop to maturity, that the rate of growth is unusually rapid, and that the timber is of good quality when the right silvicultural measures are adopted.

The above remarks apply to a large area of " plantable " land in this country but there remain great stretches on which the soil or the exposure is such that the development of plantations of different species cannot be predicted with any approach to accuracy. The policy in such cases is to restrict operations to the scale of experiment. Some of the earlier planting was carried out on such land but it was quickly stopped pending the results of experimental plantations.

With regard to the use of exotic conifers, attention has already been drawn to the resemblance, climatically, of these islands to the coastal forest region of the west of North America rather than to continental Europe. It is found accordingly that the American conifers are more at home than the European. The sole indigenous conifer of economic importance is the Scots pine which, as a rough generalisation, thrives best on the eastern and drier side of Great Britain. For the western and wetter side there are no European conifers which compare with the Douglas fir and hemlock spruce for rate of growth and production of useful timber, the American Sitka spruce grows much more quickly than the Norway spruce, while *Abies grandis* from British Columbia not only grows quicker but resists *Chermes nüsslini* which is so destructive of the European silver fir that the latter has now been abandoned as a forest tree. On the other hand, there is no Western American broadleaved tree with the exception of the Oregon alder which shows any promise of becoming a useful forest tree in Great Britain.

Two other exotic conifers which thrive well in this country may be mentioned. The Japanese larch is a quicker growing and healthier tree than the common larch, especially in the wetter parts of the country, while Corsican pine on certain types of soils in southern and eastern England, and on sand dunes generally, is a much quicker growing tree and far less subject to insect pests than the Scots pine. Its timber, too, is excellent when properly grown.

One of the arguments advanced against pure coniferous woods of large extent and also, though from a rather different point of view, against planting exotics, is the risk of serious loss from insects and fungi. It seems impossible to generalise on this subject. On the one hand there are the examples of the enormous damage done to the spruce and balsam fir forests of Eastern North America by spruce bud worm and to the spruce and pine forests of Germany by the nun moth and other insects. On the other hand, some two million acres in the Landes of Gascony have been planted with conspicuous success using a single coniferous species, *Pinus*

pinaster. Insect and fungus pests are not peculiar to conifers as witness the frequent defoliation of oaks in the south of England by the roller moth and the practical extermination of the most important American chestnut by an exotic fungus *Endothia parasitica*. Other examples on one side or other of the argument can readily be produced.

It appears to be a fact that large masses of a single species favour the multiplication of insect pests and where possible it is desirable to break up the area by the introduction of other species. It is difficult to define what is meant by a " large mass ", but certainly the 50,000 acres or so which is the largest unit likely to be secured in Great Britain is not large in the sense that forests are regarded abroad.

So far as Britain is concerned it must be borne in mind that all the useful coniferous trees, except Scots pine, were originally exotic. In actual numbers the Scots pine probably has more pests than any of them, pests which kill trees, make the stems crooked, and so on. Nevertheless, the tree is very hardy and in the vegetative sense resists its enemies well. It might be thought that the exotics which had been longest in the country and consequently " acclimatised " would be the safest to plant, yet the common silver fir, which has been planted for at least 300 years and has produced trees of great dimensions, developed some 30-40 years ago an insect *Chermes nüsslini*, which is fatal to it.

It is important to consider how the chief Western American conifers are faring. The hemlock spruce and Sitka spruce appear perfectly healthy and subject only to pests which do occasional, or minor, damage. The Douglas fir has acquired within the last twenty or thirty years a pest, *Chermes cooleyi*, which is common in Western America and alternates between Douglas fir and Sitka spruce. It is not known on the latter in Great Britain. This chermes retards the growth of young Douglas firs which subsequently recover and grow freely. So far there is no authenticated case of fatal injury, and having regard to the feeding habits of the insect it is improbable that *Chermes cooleyi* will ever become a really serious pest on Douglas fir.

The question of the use of exotic forest trees received close attention at the Empire Forestry Conference of 1928 when reports were received from all parts of the Empire. It is to appear again on the agenda of the forthcoming Empire Forestry Conference to be held in South Africa next September. Beyond remarking that nearly every country has reaped great advantages by the judicious use of exotic trees this is not the place to review the results of these extensive enquiries.

It will be apparent from the foregoing remarks that the Commissioners' policy with regard to the planting of pure conifers and the use of exotics must necessarily be of the nature of a compromise.

It was essential after the war that the depleted stocks of softwoods should be built up again as quickly as possible. This in itself could be held to justify the planting of large blocks of pure conifers and the extensive use of the quick-growing conifers, such as Douglas fir, Sitka spruce, Japanese larch and Corsican pine. There are now many thousands of acres of those species which are rapidly growing into pitprop dimensions and could be utilised in a few years should emergency arise. If not, they will grow on to form in the quickest possible time a reserve of saw timber.

From such a beginning it has seemed reasonable to proceed on the lines of not " putting all the eggs in one basket " :—to increase, for example, under suitable conditions the proportions of the well-tried Norway spruce and European larch instead of the Sitka spruce and Japanese larch respectively.

There is also the important question of preventing the introduction of further pests. This has been dealt with, so far as it is possible to deal with such a difficult matter, by prohibiting the importation of living coniferous plants.

To revert to the question of the proportion of broadleaved to coniferous planting. Directions were given some years ago that in the two largest of the former Crown woods (New and Dean Forests) broadleaved trees were to be given preference wherever the conditions were suitable. It is interesting to note that in the great replanting which took place in those forests just after the Napoleonic wars considerable areas of oak never grew into commercial timber for the reason that the soil conditions were too poor. Care has to be taken not to repeat the error, but by substituting less exacting species such as beech and sycamore for oak it is hoped to maintain a large proportion of each forest under broadleaved trees.

The same procedure with the same precautions has since been gradually extended to the newly acquired forests. Thus the total area planted with hardwoods in the decade 1920-1929 was 7,510 acres, in the succeeding five years it was 8,880 acres and the average annual area is at present approximately 1,750 acres per annum. There are also some 800 acres in various stages of natural regeneration.

Amenities.—The question of amenities in relation to woodlands is to some extent a matter of individual taste. In the extreme case objection is taken to any form of woodland by people who dislike change in a familiar scene or object to trees in the juvenile stages. There is a more general objection to conifers which arises primarily out of the sombreness of large areas of dark-coloured evergreens, such as pine and spruce. The dislike of smaller areas is not always consistent. The Commissioners recall, for example, a case in which the same people objected both to the cutting down and to the replanting of pines on the same piece of ground.

It is also stated, sometimes, that the new British coniferous forests will resemble the great German forests in character by covering the whole landscape in dark green. The comparison, in most cases, it not very apt because the upper limit of economic tree growth in the hill country of Great Britain is relatively low and it is but rarely possible to plant to the skyline. A more accurate comparison would be with alpine forests in which the trees are seen against a background of higher country.

There is, however, general agreement that a good deal may be done to improve the amenities in coniferous forests by relatively simple means. These include the planting of hardwood belts along main roadsides in flat country (this is being done in the pine forests of East Anglia) and of hardwood belts and groups in strategic places, the avoidance of straight outlines to plantations and the careful lay-out of roads and rides. Variety can be secured by changes of species within the body of the coniferous plantations. It is intended to apply these principles in those parts of Hardknott Forest, including Eskdale, which are to be planted.

So far reference has been made to the external amenities of plantations. The Commissioners hope that the day will come when, the risk of fire being diminished, it will be possible to admit the public more freely into the plantations. It will, they believe, then be conceded that, provided the choice of species and subsequent silvicultural treatment have been happy, a coniferous wood can be a very beautiful thing.

As regards the place of exotic trees in the amenities of woodlands, there is considerable difference of opinion. British gardeners have spared no expense in collecting from all over the world the most beautiful flowering plants and shrubs and trees. It seems somewhat illogical that a process which has given rise to so much pleasure should stop short at the garden wall.

The Commissioners have recently been in communication with the Council for the Preservation of Rural England on the subject of the relation of forestry and afforestation to the amenities of the countryside. As a result a joint informal Committee has been formed to meet from time to time for the discussion of outstanding questions. In these densely-populated islands there is scarcely an acre of accessible land in which someone has not an economic or sentimental interest. The Commissioners consequently welcome the opportunity of discussing with so representative a body and from the point of view of the national welfare those changes which are inevitable in the utilisation of the soil if an adequate reserve of standing timber is to be provided.

Joint Enterprises.

Bedgebury Arboretum.—The Commissioners are associated with the Director and staff of the Royal Botanic Gardens at Kew in the formation of a new arboretum away from the smoke

and fumes of London. For many years past the specimen conifers at Kew had shown unmistakable signs of suffering from smoke damage and in 1923 the Commissioners were approached by the Director of the Gardens with a view to the selection of a new site on which a complete collection of the hardier conifers could be established. After considering various places Bedgebury Forest near Goudhurst in Kent was selected as reasonably near London, suitable in soil and climate, and already stocked with a certain number of fine specimen trees. It was arranged that during the period of formation the Commissioners should undertake the clearing and fencing of the ground while the Kew Gardens authorities were responsible for the provision of the trees. The cost of establishment and subsequent upkeep was to be met from a joint fund voted annually by the Ministry of Agriculture and the Commissioners. Work was started in 1925 on an area of 50 to 60 acres and the collection is now virtually complete.

Each species is represented as a rule by a minimum of six specimens and varieties by three specimens planted to form a small clump, to be thinned out later on if necessary. About 2,500 trees have been planted, representing 237 species and 310 varieties of 26 genera of conifers, and in addition 94 species of broadleaved trees and 80 species and many varieties of rhododendrons and azaleas have been introduced in suitable spots. For the most part the trees are making good progress although there have been difficulties to contend with in the way of attack by insects and fungi. Honey fungus in particular has been troublesome. Some of the trees have made quite spectacular growth, notably certain of the larches, one of the plants of European larch attaining a height of 20 feet five years after planting. Apart from the larches the most successful species to date are *Cryptomeria japonica; Sequoia gigantea, S. sempervirens; Cedrus atlantica; Picea asperata, P. likiangensis, P. omorica; Abies concolor, A. lowiana, A. nobilis, A. grandis, A. pinsapo; Pinus pinaster, P. armandii, P. nigra* and varieties, *P. radiata, P. thunbergii, P. banksiana; Thuja plicata, Chamaecyparis lawsoniana* varieties and *Cupressus nootkatensis.*

There is an interesting patch of natural regeneration near the *Larix* section of the Arboretum. Here Scots pine, Lawson cypress, Douglas fir, Thuya, Sitka spruce and *Abies grandis* and some others have appeared in profusion. It is proposed to cut out some of the young pine to allow the more interesting species to develop.

Closely adjoining the Arboretum a further area of some 40 acres was set aside in 1929 for the establishment of a series of so-called forest plots, the object of which is to compare the growth of a number of different species planted under forest conditions. The species selected include mainly trees of potential value as timber and the commoner species of both conifers and hardwoods have generally been omitted. An exception was made in the case

of certain important forest trees such as Douglas fir, Scots pine and Corsican pine, several plots of each of which have been established with plants raised from seed of different geographical origins. Up to date almost 100 plots of one-quarter acre each have been planted with over 30 species of conifers and 25 species of broadleaved trees. The majority of the plots have made excellent progress, and among the most prominent are the following (the figures in brackets relate to the average height five years after planting) :—*Nothofagus obliqua* (6½ feet), *Nothofagus procera* (5 feet) : these are trees from the south of Chile which appear to thrive admirably at Bedgebury; hybrid larch (11 feet), and *Tsuga heterophylla* (7 feet). The fastest growth has been made by a plot of Oregon alder (*Alnus oregona*); after only four growing seasons the trees have attained a height of 18 feet. Of the plots of different seed origins those of European larch, Scots pine and Corsican pine are perhaps the most interesting. Other species which have been successfully established include Serbian spruce (*Picea omorica*), *Picea asperata*, *Cryptomeria japonica*, Nootka cypress (*Cupressus nootkatensis*), tulip tree (*Liriodendron tulipifera*) and *Quercus mirbeckii*.

Benmore.—In 1925 Mr. Harry George Younger made a gift to the Forestry Commission of the estate of Benmore in Argyllshire, comprising 10,200 acres, and three years later he generously augmented his gift of land by creating a Trust known as the Younger Benmore Trust, the income from which is used for the maintenance of the gardens and grounds, now open to the public. The mansion house is utilised as a school for forest apprentices and as a hostel which has been visited by many societies and a large number of forestry and botanical students.

The gardens, by arrangement with H.M. Office of Works, have been placed under the control of the Regius Keeper of the Royal Botanic Garden at Edinburgh, but with this exception the whole of the estate is administered by the Forestry Commission. The woods and plantations at present cover about 2,000 acres, including forest nurseries, a forest garden of 120 acres, an arboretum and an interesting collection of conifers, now in their prime. Included in the estate is " Puck's Glen," which is maintained by the Commission for the use of the public. Paths have been constructed for ready access and a rest-house has been built as a memorial to the late Sir Isaac Bayley Balfour. New plants and shrubs have been introduced to the glen by the present Regius Keeper with whom the Commissioners have co-operated in all matters.

Phenological Gardens.—The relation between weather conditions and crops is a matter which is now receiving considerable attention in this country and abroad. Systematic work began in Britain in 1925 when the Agricultural Meteorological Committee was appointed by the Ministry of Agriculture and a number of crop weather stations were set up in different parts of the country. At first the

work was confined to the study of agricultural crops in relation to weather but, in 1930, the Commissioners decided to accept the invitation of the Agricultural Meteorological Committee to bring forest trees within the scope of the scheme. A Forestry Sub-Committee was appointed and a scheme drawn up for the establishment of three forest climatological stations equipped on the same lines as the agricultural crop weather stations but dealing with forest trees only. The stations selected were Benmore in Argyllshire, Parkend in the Forest of Dean, Gloucestershire, and Lynford, near Thetford, Norfolk. The scheme arranged for the establishment of small plots of six species of trees at each station, namely three conifers, European larch, Douglas fir and Sitka spruce and three broadleaved trees, oak, beech and ash. These were planted in the spring of 1932 and have been kept under continuous observation ever since. Flushing stages and the elongation of the leading shoots are observed at regular intervals during the growing period.

In addition to the routine meteorological records and observations on the tree plots other phenomena of interest are recorded, such as the flowering and fruiting of the commoner forest trees, occurrence of frost damage in the plantations, incidence of insect pests, abundance of rodents and other animals, etc., while a link is maintained with the agricultural stations through phenological observations on certain herbs and shrubs which are distributed to all stations alike.

In the two growing seasons over which detailed records have been kept the outstanding fact has been the similarity between the results at the three stations as regards flushing stages and length of growing period. This is remarkable in view of the wide differences in the amount of rainfall registered and in the latitudes of the stations; Benmore, for example, had three times as much rain as either of the other two stations during the 1933 growing season; on the other hand the temperature readings were generally similar, which suggests that temperature is the governing factor in growth stages rather than moisture.

OPERATIONS

FOREST YEAR 1933-34.

Finance.

The balance in the Forestry Fund at the commencement of the forest year was £250,048. Receipts from Parliamentary Votes (£450,000) and Forestry Operations (£172,953) amounted to £622,953. Payments amounted to £618,852, so that the balance in the Fund at September 30th, 1934, was £254,149. The progress of payments and receipts is indicated in the table below.

Forestry Fund: Payments and Receipts.

Year ending 30th September.	Payments.			Receipts.			Net Payments.		
	Proposed.	Actual.	Excess (+) Deficit (−)	Proposed.	Actual.	Excess (+) Deficit (−)	Proposed.	Actual.	Excess (+) Deficit (−)
	£	£	£	£	£	£	£	£	£
First decade, 1920–29. (10½ financial years)	—	4,502,018	—	—	851,484	—	3,892,000	3,650,534	−241,466
Second decade:									
1930... ...	958,000	808,237	−149,763	145,000	148,337	+ 3,337	813,000	659,900	−153,100
1931... ...	1,019,000	842,490	−176,510	158,000	171,556	+13,556	861,000	670,934	−190,066
1932... ...	798,000	761,220	− 36,780	159,000	151,466	− 7,534	639,000	609,754	− 29,246
1933... ...	602,000	582,259	− 19,741	153,000	146,629	− 6,371	449,000	435,630	− 13,370
1934... ...	600,000	618,852	+ 18,852	150,000	172,953	+22,953	450,000	445,899	− 4,101
						Total	—	6,472,651	—

Land Acquisition.

Acquisition during the year amounted to 63,182 acres, of which 29,332 acres were classified as plantable. Disposals and adjustments amounted to 1,269 acres (446 acres plantable), thus reducing the net acquisition of plantable land to 28,886 acres. Net acquisitions to the end of the forest year 1934 are compared in the table on page 14.

Planting Programme.

State Forests.

The area planted during the year was 21,667 acres, compared with 21,051 acres in 1933 and 22,663 acres in 1932. The figure includes 754 acres replanted after damage by fire.

Assistance to Local Authorities and Private Owners.

The area planted during the year amounted to 5,585 acres, compared with 4,574 acres in 1933, 5,184 acres in 1932 and 5,917 acres in 1931. Of this figure 5,413 acres were planted by means of grants and 172 acres under a proceeds-sharing scheme initiated by the Development Commissioners. Details are given on page 86.

The Forestry Fund.

The position of the Forestry Fund at September 30th, 1934, and at the same date in previous years is shown in Table I.

Table I.—Forestry Fund Account.

Year ending 30th September.	Balance from preceding Year.	Receipts.			Payments. (Table II, Heads A to L).	Balance in Forestry Fund, 30th September.
		Parliamentary Votes.	From Forestry Operations, etc. (Table II, Head Z).	Total.		
	(1)	(2)	(3)	(4)	(5)	(6)
First decade:	£	£	£	£	£	£
Five years, 1920–24	—	1,734,000	192,600	1,926,600	1,428,420	498,180
1925	498,180	300,000	121,933	421,933	517,452	402,661
1926	402,661	335,000	122,341	457,341	608,066	251,936
1927	251,936	645,400	127,764	773,164	618,997	406,103
1928	406,103	485,600	141,492	627,092	648,936	384,259
1929	384,259	500,000	145,354	645,354	680,147	349,466
Total, 1925–29	—	2,266,000	658,884	2,924,884	3,073,598	—
Total, First decade	—	4,000,000	851,484	4,851,484	4,502,018	—
Second decade:						
1930	349,466	937,800	148,337	1,086,137	808,237	627,366
1931	627,366	490,000	171,556	661,556	842,490	446,432
1932	446,432	399,000	151,466	550,466	761,220	235,678
1933	235,678	450,000	146,629	596,629	582,259	250,048
1934	250,048	450,000	172,953	622,953	618,852	254,149
Total, 1930–34	—	2,726,800	790,941	3,517,741	3,613,058	—
Grand Total	—	6,726,800	1,642,425	8,369,225	8,115,076	—

Balances remaining in the Fund at September 30th include provision for the succeeding six months of the financial year.

An analysis of payments and receipts by Heads of Account is given in Table II. Compared with the previous year, total payments rose from £582,259 to £618,852, an increase of £36,593, mainly under the heads of forestry operations and forest workers' holdings. Receipts were greater by £26,324, and net payments were therefore only £10,269 more than in 1933. It may be noted that Heads of Account differ in some respects from those under which estimates are presented to Parliament.

Table II.—Payments and Receipts by Heads of Account.

Year ending 30th September.	PAYMENTS.												RECEIPTS.	NET PAYMENTS.
	A. Salaries, Wages and Allowances.	B. Headquarters' Charges.	C. Assistant Commissioners' Charges.	D. Divisional Officers' Charges.	E. Forestry Operations.	F. Advances for Afforestation Purposes.	G. Education.	H. Research and Experiment.	J. Agency and Advisory Services.	K. Special Services.	L. Forest Workers' Holdings.	Total.	Z.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	£	£	£	£	£	£	£	£	£	£	£	£	£	£
First decade: Five years, 1920–24...	224,275	10,271	14,898	32,659	857,722	127,439	37,702	12,682	91,776	13,960	5,036	1,428,420	192,600	1,235,820
1925 ...	49,191	2,315	2,770	7,643	369,281	31,166	7,460	2,601	—	2,850	42,175	517,452	121,933	395,519
1926 ...	51,769	2,097	2,864	8,685	451,124	12,012	8,192	3,981	—	3,403	63,939	608,066	122,341	485,725
1927 ...	53,836	2,934	3,108	8,455	450,854	14,024	7,525	4,424	—	483	73,354	618,997	127,764	491,233
1928 ...	56,190	2,256	3,500	8,107	488,639	10,776	7,594	5,872	—	1,276	64,726	648,936	141,492	507,444
1929 ...	58,806	2,803	3,446	8,885	501,217	12,407	7,531	7,367	—	1,370	76,225	680,147	145,354	534,793
Total, 1925–29	269,882	12,405	15,688	41,775	2,261,115	80,385	38,302	24,245	—	9,382	320,419	3,073,598	658,884	2,414,714
Total, First decade	494,157	22,676	30,586	74,434	3,118,837	207,824	76,004	36,927	91,776	23,342	325,455	4,502,018	851,484	3,650,534
Second decade: 1930 ...	63,202	2,571	7,658	9,418	598,119	14,102	9,355	6,901	—	493	96,418	808,237	148,337	659,900
1931 ...	65,347	5,267	4,704	9,787	629,461	14,067	9,628	7,577	—	337	96,315	842,490	171,556	670,934
1932 ...	63,313	5,851	3,414	10,007	603,735	13,649	6,925	6,653	—	674	46,999	761,220	151,466	609,754
1933 ...	62,110	4,219	3,416	9,401	465,637	12,103	6,002	7,291	—	568	11,503	582,259	146,629	435,630
1934 ...	63,069	4,119	2,960	9,449	498,053	14,121	5,292	6,286	—	860	14,643	618,852	172,953	445,899
Total, 1930–34	317,050	22,027	22,152	48,062	2,795,005	68,042	37,202	34,708	—	2,932	265,878	3,613,058	790,941	2,822,117
Grand Total	811,207	44,703	52,738	122,496	5,913,842	275,866	113,206	71,635	91,776	26,274	591,333	8,115,076	1,642,425	6,472,651

Table II is limited to sums actually expended or received, recorded by the heads of account under which they occurred. In subsequent tables, which are based on commercial practice, outstanding receipts and payments are brought to account, salaries and overhead charges (Heads A to D) are allocated to appropriate objects of expenditure, and adjustments are made between various heads of account in respect of produce used for forest purposes and transfers of land and buildings between the forests and forest workers' holdings. In addition, payments and receipts in respect of forestry operations conducted by the Commissioners in Ireland during the period 1919 to 1923, which are necessarily included in Tables I and II, are omitted from the succeeding tables. (Expenditure in Ireland amounted to £90,514 and income £26,041.)

Expenditure and income adjusted on the basis stated above are shown in Table IIa.

Table IIa.—Expenditure and Income.

Year ending 30th September.	A to D. Superior Supervision and Overhead Charges.	Expenditure (including Allocation of Column 1).								Income.				Net Expenditure.
		E. Forestry Operations.	F. Advances for Afforestation. Purposes.	G. Education.	H. Research and Experiment.	J. Agency and Advisory Services.	K. Special Services.	L. Forest Workers' Holdings.	Total.	Z1. Forestry Operations.	Z5. Forest Workers' Holdings.	Miscellaneous.	Total.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
First decade:	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Five years, 1920–24...	245,930	994,533	146,698	52,510	34,482	90,763	36,142	5,906	1,361,034	192,641	8	4,601	197,250	1,163,784
1925	60,205	405,972	34,387	9,915	6,404	1,954	8,178	56,522	523,332	134,244	1,257	850	136,351	386,981
1926	65,091	493,464	14,960	10,600	7,437	2,007	4,409	75,837	608,714	122,184	3,374	727	126,285	482,429
1927	67,776	503,918	16,822	9,470	8,337	1,538	3,151	82,524	625,760	135,386	6,074	379	141,839	483,921
1928	70,606	536,854	13,491	9,426	10,769	1,643	5,758	95,880	673,821	153,721	8,216	185	162,122	511,699
1929	72,570	577,836	15,336	9,392	12,221	1,328	3,661	73,214	692,988	143,932	8,586	194	152,712	540,276
Total, 1925–29	336,248	2,518,044	94,996	48,803	45,168	8,470	25,157	383,977	3,124,615	689,407	27,507	2,335	719,309	2,405,306
Total, First decade	582,178	3,512,577	241,694	101,313	79,650	99,233	61,299	389,883	4,485,649	882,108	27,515	6,936	916,559	3,569,090
Second decade:														
1930 ...	83,414	675,631	16,944	10,208	12,338	1,177	2,097	108,575	826,970	147,994	12,206	406	160,606	666,364
1931 ...	85,803	701,434	16,573	11,411	12,598	1,167	1,891	109,020	854,094	165,068	13,583	386	179,037	675,057
1932 ...	80,972	661,180	16,341	8,884	12,326	1,135	2,357	56,357	758,680	144,216	16,811	77	161,104	597,476
1933 ...	79,182	527,218	14,353	8,226	12,182	944	2,099	19,437	584,459	137,041	17,228	170	155,339	429,120
1934 ...	79,600	576,853	16,450	8,058	11,301	997	2,453	21,417	637,529	163,132	17,372	518	181,022	456,507
Total, 1930–34	408,971	3,142,316	80,661	46,787	60,745	5,420	10,897	314,806	3,661,632	758,351	77,200	1,557	837,108	2,824,524
Grand Total	991,149	6,654,893	322,355	148,100	140,395	104,653	72,196	704,689	8,147,281	1,640,459	104,715	8,493	1,753,667	6,393,614
Percentage		*81·7*	*4*	*1·8*	*1·7*	*1·3*	*0·9*	*8·6*	*100*	*93·5*	*6*	*0·5*	*100*	

Note.—The above and subsequent tables do not include the amount of the valuation (£1,738,075) placed on the Crown properties transferred to the Commission under the Forestry (Transfer of Woods) Orders in Council dated March 21st, 1924 and June 1st, 1926.

Subheads A to D—General Organisation. Expenditure, £79,600.

Compared with 1933, expenditure rose by £418. The number of District Officers increased by four during the year. At 30th September, there were 14 Divisional Officers (including 2 Deputy Surveyors) and 42 District Officers.

Subhead E—Forestry Operations. Expenditure, £576,853; Income, £163,132.

Details of expenditure and income are given in Table E. Gross expenditure was £49,635 more than in 1933, mainly due to increases of £18,821 on acquisition of land, £10,708 on cultural operations and £12,618 on miscellaneous items. Local supervision increased by £2,567, and expenditure on preparation and sale of produce by £4,200. Income from forestry operations rose by £25,191.

Overhead Charges, £27,898; *Superior Supervision*, £31,856 *and Local Supervision*, £46,034.—Overhead charges are in respect of salaries, allowances and other expenses in the offices of the Commissioners and Assistant Commissioners. Superior supervision represents similar expenditure in respect of the Deputy Surveyors, Divisional Officers and District Officers; and local supervision includes the salaries, housing allowances and miscellaneous expenses of Foresters and Foremen. During the year the number of Foresters and Foremen employed in forestry operations was increased by eleven. At 30th September, the total numbers employed were :—Foresters 144 (Head, 6; Grade I, 28; Grade II, 110) and Foremen 126.

Table E.—Forestry Operations.

Year ending 30th September.	EXPENDITURE (Table IIa, Column 2).									INCOME (Table IIa, Column 10).					NET EXPENDITURE.
	Overhead Charges. (1)	Superior Supervision. (2)	Local Supervision. (3)	Acquisition of Land, etc. (4)	Cultural Operations. (5)	Preparation and Sale of Produce. (6)	Roads and Buildings. (7)	Stores and Miscellaneous. (8)	Total. (9)	Sales of Land and Buildings. (10)	Rents and Royalties. (11)	Forest Produce. (12)	Other. (13)	Total. (14)	(15)
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
First decade : Five years, 1920–24	84,224	76,249	41,049	220,573	431,378	19,459	26,604	94,997	994,533	12,579	42,902	96,753	40,407	192,641	801,892
1925 ...	18,702	23,943	18,433	101,471	164,125	15,684	18,485	45,129	405,972	23,626	39,367	54,862	16,389	134,244	271,728
1926 ...	20,841	24,522	24,224	118,607	200,889	16,576	17,954	69,851	493,464	16,395	42,086	44,005	19,698	122,184	371,280
1927 ...	22,970	24,041	27,430	99,867	230,543	23,543	20,813	54,711	503,918	3,417	45,483	72,111	14,375	135,386	368,532
1928 ...	22,595	24,519	29,407	97,210	247,231	22,649	14,817	78,426	536,854	15,551	49,116	72,552	16,502	153,721	383,133
1929 ...	23,665	27,848	33,587	149,781	236,635	20,942	16,815	68,563	577,836	7,216	55,137	66,311	15,268	143,932	433,904
Total, 1925–29	108,773	124,873	133,081	566,936	1,079,423	99,394	88,884	316,680	2,518,044	66,205	231,189	309,841	82,232	689,467	1,828,577
Total, First decade	192,997	201,122	174,130	787,509	1,510,801	118,853	115,488	411,677	3,512,577	78,784	274,091	406,594	122,639	882,108	2,630,469
Second decade: 1930 ...	29,413	29,957	36,674	186,640	280,356	22,871	26,566	63,154	675,631	2,642	65,184	63,949	16,219	147,994	527,637
1931 ...	31,974	30,929	39,413	193,444	285,558	20,972	27,483	71,661	701,434	15,568	71,930	56,768	20,802	165,068	536,366
1932 ...	29,352	30,004	40,633	200,552	252,556	20,345	24,376	63,362	661,180	7,869	70,249	49,477	16,621	144,216	516,964
1933 ...	29,609	29,752	43,467	76,394	254,363	26,766	18,301	48,566	527,218	4,463	75,127	47,321	11,030	137,941	389,277
1934 ...	27,898	31,856	46,034	95,215	265,071	30,966	18,629	61,184	576,853	12,258	78,120	55,893	16,861	163,132	413,721
Total, 1930–34	148,246	152,498	206,221	752,245	1,337,904	121,920	115,355	307,927	3,142,316	42,800	360,610	273,408	81,533	758,351	2,383,965
Grand Total	341,243	353,620	380,351	1,539,754	2,848,705	240,773	230,843	719,604	6,654,893	121,584	634,701	680,002	204,172	1,640,459	5,014,434
Percentage	*5·1*	*5·3*	*5·7*	*23·2*	*42·8*	*3·6*	*3·5*	*10·8*	*100*	*7·4*	*38·7*	*41·5*	*12·4*	*100*	

Acquisition of Land, Buildings and Standing Timber.—Expenditure amounted to £95,215 of which £70,309 was in respect of purchases of land including standing timber and buildings, and £24,906 in respect of land held on long lease or feu. (This expenditure is not directly applicable to the areas acquired during the year, particulars of which follow.)

The total area of land acquired during the forest year 1933-34 amounted to 63,182 acres, of which 29,332 acres were classified as plantable. On the other hand disposals and adjustments amounted to 1,269 acres (446 acres plantable).

The average rent or feu duty for land acquired for forestry operations during the year by lease or feu was approximately 2s. per acre and the average price for such land purchased, approximately £2 10s. per acre. If the whole outlay in respect of land, buildings, timber, etc., were charged against plantable land the figures would be 2s. 8d. and £3 12s. 2d. respectively. Land and buildings for forest workers' holdings are excluded.

The net total area in Great Britain in respect of which the legal formalities of acquisition by the Department had been completed by 30th September, 1934, was 771,046 acres, the corresponding figures in the two previous annual reports being 723,543 and 705,952 acres. In addition to these completed acquisitions, entry had been secured to a number of other properties. Details are given in the table below, which also shows the area of " plantable " and " other land ", i.e., land which is either too poor to plant or is required for other purposes.

Land acquired by Lease, Feu and Purchase from 29th November, 1919, to 30th September, 1934.

—	By Lease and Feu.			By Purchase.			Total Acquired.
	Plantable (including planted).	Other Land.	Total.	Plantable (including planted).	Other Land.	Total.	
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
England and Wales—							
Finally completed ...	109,390	25,025	134,415	176,986	55,168	232,154	366,569
Entry secured	2,836	220	3,056	—	—	—	3,056
Total ...	112,226	25,245	137,471	176,986	55,168	232,154	369,625
Scotland—							
Finally completed ...	77,229	79,274	156,503	114,601	133,373	247,974	404,477
Entry secured	—	—	—	3,064	11,346	14,410	14,410
Total ...	77,229	79,274	156,503	117,665	144,719	262,384	418,887
Great Britain	189,455	104,519	293,974	294,651	199,887	494,538	788,512

Of the net total area acquired by lease, feu and purchase in Great Britain to 30th September, 1934, 484,106 acres were classified at the time of acquisition as plantable. Of the plantable area 289,212 acres (60 per cent.) were in England and Wales and 194,894 acres (40 per cent.) in Scotland.

In addition to the above-mentioned areas, Crown woodlands extending to about 120,000 acres (of which some 60,000 acres are plantable) have been transferred to the Forestry Commissioners.

The total area of land in the Commissioners' control thus approximates to 909,000 acres. In round figures the utilisation as at 30th September, 1934, was as shown in the table on page 69.

Utilisation of Land as at 30th September, 1934.

Division.	No. of Units.	Forest Land.				Nurseries.	Agricultural land.	Holdings.	Unplantable and Miscellaneous.	Total.
		Acquired plantations.	Planted by Commission	To be planted.	Total.					
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
I ...	15	1,600	22,000	49,500	73,100	73	3,200	1,200		
II ...	22	2,200	37,000	31,500	70,700	79	4,600	2,700		
III ...	23	1,500	25,000	16,000	42,500	50	5,100	1,250		
IV ...	19	8,000	14,000	14,200	36,200	45	500	650	103,000	477,000
V ...	11	1,000	45,000	14,200	60,200	163	4,000	3,200		
VI ...	7	23,700*	9,000	2,500	35,200	37	800	300		
VII ...	4	20,500	6,000	600	27,100	43	800	200		
England and Wales ...	101	58,500	158,000	128,500	345,000	490	19,000	9,500	103,000	477,000
N. ...	31	700	33,500	29,300	63,500	85	1,700	500		
N.E. ...	23	3,300	27,500	21,200	52,000	122	4,300	800	221,000	432,000
S.W. ...	31	3,500	31,000	49,000	83,500	104	4,000	800		
Scotland ...	85	7,500	92,000	99,500	199,000	311	10,000	2,100	221,000	432,000
Total ...	186	66,000	250,000	228,000	544,000	801	29,000	11,600	324,000	909,000

* Includes 5,000 acres of non-enclosurable woodland.

England and Wales.

FORESTRY COMMISSION UNITS.

1. Chopwell, Durham.*
2. Delamere, Cheshire.*
3. Hafod Fawr, Merioneth.*
4. Dean Forest, Glos., Hereford and Monmouth.*†
5. Tintern, Monmouth.*
6. Dymock, Glos. and Hereford.*
7. Salcey, Bucks and Northants.*
8. Hazelborough, Bucks and Northants.*‡
9. Alice Holt, Hants.*
10. Woolmer, Hants.*
11. Bere, Hants.*
12. New Forest, Hants.*
13. Parkhurst, Isle of Wight.*
14. Bedgebury, Kent and Sussex.*
15. Rothbury, Northumberland.
16. Thornthwaite, Cumberland.
17. Allerston, Yorks.
18. Selby, Yorks.
19. Gwydyr, Caernarvon and Denbigh.
20. Coed-y-Brenin, Merioneth.§
21. Cannock Chase, Stafford.
22. Rockingham, Northants.
23. Swaffham, Norfolk.
24. Thetford Chase, Norfolk and Suffolk.
25. Rendlesham, Suffolk.
26. Ampthill, Bedford.
27. Mortimer, Hereford, Radnor and Salop.
28. Walcot, Salop.
29. Kerry, Montgomery and Salop.
30. Rheola, Glamorgan.
31. Margam, Glamorgan.
32. Llantrisant, Glamorgan.
33. Llanover, Monmouth.
34. Chepstow, Glos. and Monmouth.
35. Bodmin, Cornwall.
36. Halwill, Devon.
37. Haldon, Devon.
38. Eggesford, Devon.
39. Brendon, Somerset.‖
40. Quantocks, Somerset.
41. Wareham, Dorset.
42. Bramshill, Berks and Hants.
43. Chiddingfold, Surrey and Sussex.
44. Ennerdale, Cumberland.
45. Clipstone, Derby and Notts.
46. Beddgelert, Caernarvon.
47. Cynwyd, Merioneth.
48. Dovey, Merioneth and Montgomery.
49. Radnor, Radnor.
50. Lyminge, Kent.
51. Kielder, Northumberland.¶
52. Haugh, Hereford.
53. Wyre, Worcester.
54. Brecon, Brecknock.
55. Brechfa, Carmarthen.
56. Ringwood, Dorset and Hants.
57. Bourne, Lincoln and Rutland.
58. Hamsterley, Durham.
59. Hope, Derby.
60. Laughton, Lincoln.
61. Friston, Sussex.
62. Micheldever, Hants.
63. Ferndown, Dorset.
64. Wilsey Down, Cornwall.
65. Glasfynydd, Brecknock.
66. Rosedale, Yorks.
67. Ampleforth, Yorks.
68. Cwmeinion, Cardigan.
69. Tarenig, Cardigan and Montgomery.
70. Mathrafal, Montgomery.
71. Pembrey, Carmarthen.
72. Westbury, Hants.
73. Buriton, Hants and Sussex.
74. Bawtry, Notts.
75. Sherwood, Notts.
76. Swanton, Norfolk.
77. Dunwich, Suffolk.
78. Brynmawr, Cardigan.
79. Bruton, Somerset and Wilts.
80. Myherin, Cardigan.
81. Harwood, Northumberland.
82. Kershope, Cumberland.
83. Combley, Isle of Wight.
84. Brighstone, Isle of Wight.
85. Slaley, Northumberland.
86. Clocaenog, Denbigh and Merioneth.
87. Dyfnant, Montgomery.
88. Crychan, Carmarthen.
89. Caio, Carmarthen.
90. Dartmoor, Devon.
91. Yardley Chase, Bedford and Northants.
92. Arkengarthdale, Yorks.
93. Mynydd Ddu, Brecknock and Monmouth.
94. Herodsfoot, Cornwall.
95. West Woods, Wilts.
96. Bardney Woods, Lincoln.
97. Redesdale, Northumberland.
98. Challock, Kent.
99. Goodwood, Sussex.
100. Vinehall, Sussex.
101. Lydford, Devon.

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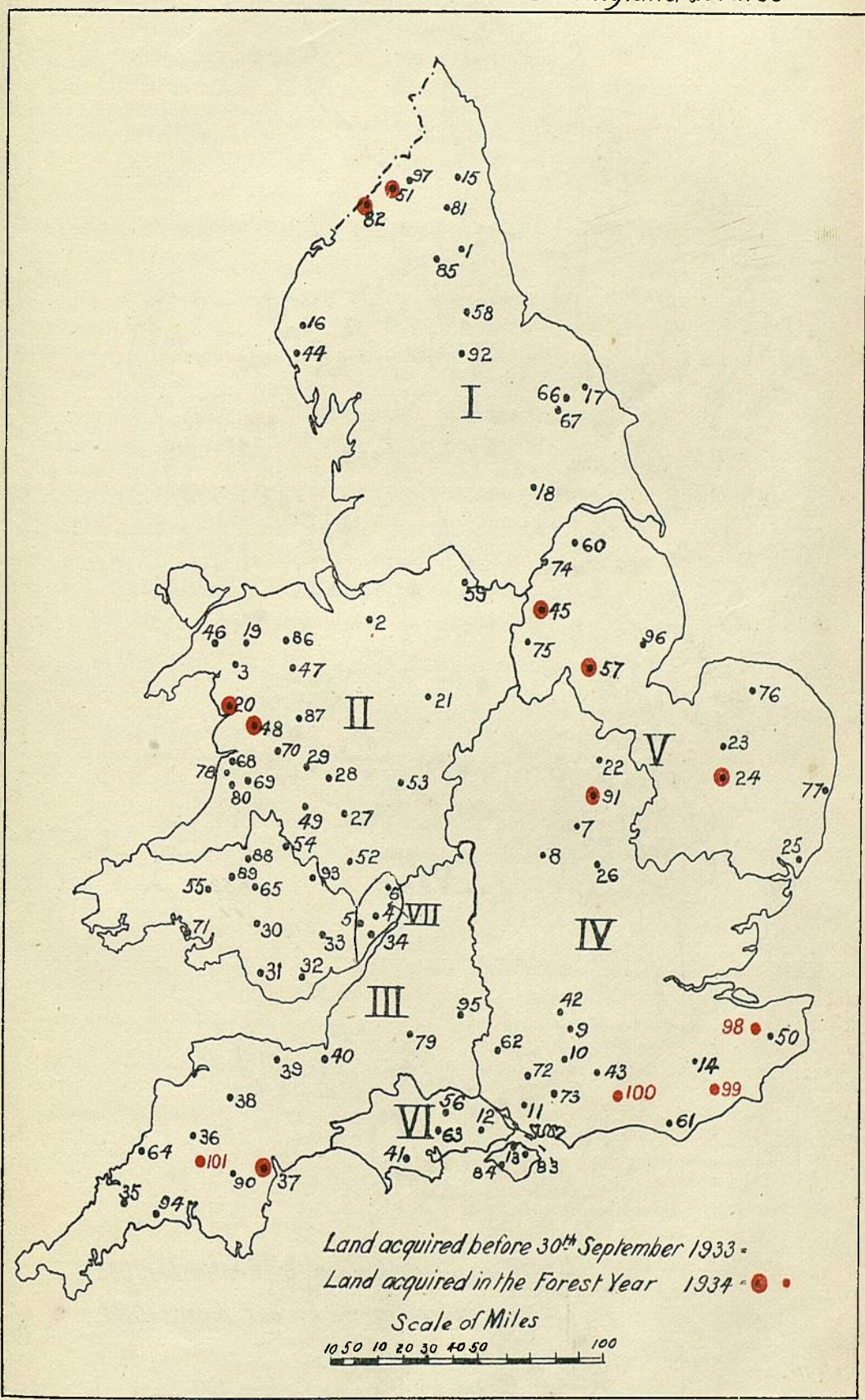
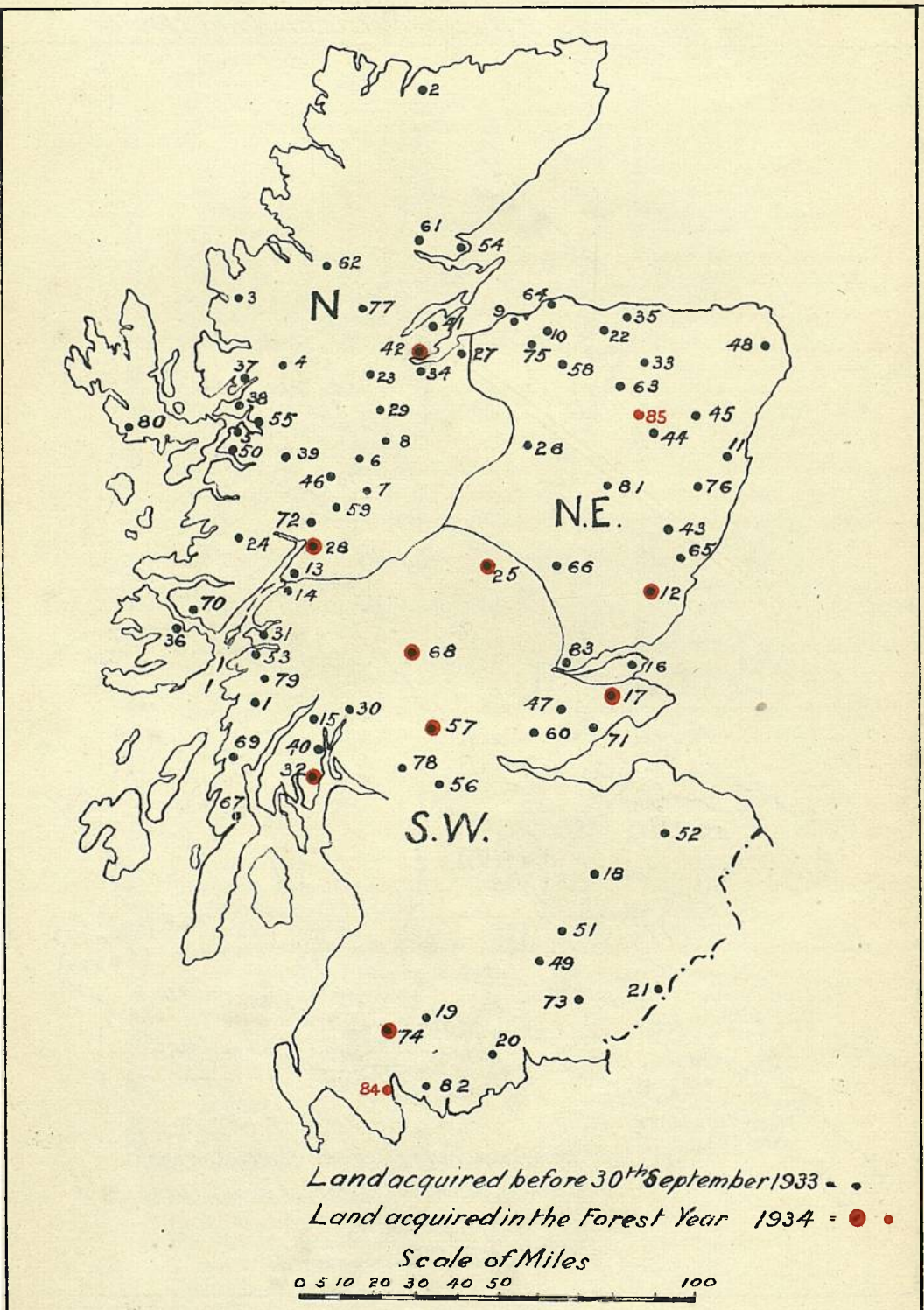
* Former Crown woods.
† Includes area previously known as Chase.
‡ Includes area previously known as Brackley.
§ Formerly known as Vaughan.
‖ Formerly known as Exmoor.
¶ Formerly known as North Tyne Valley.

Sketch map showing the location of units and the boundaries of the Divisions of England & Wales



Sketch map showing the location of units and the boundaries of the Divisions in Scotland



Malby & Sons.

Scotland.

Forestry Commission Units.

1. Inverliever, Argyll.*
2. Borgie, Sutherland.
3. Slattadale, Ross.
4. Achnashellach, Ross.
5. Ratagan, Inverness and Ross.
6. Inchnacardoch, Inverness.
7. South Laggan, Inverness.
8. Port Clair, Inverness.
9. Culbin, Moray and Nairn.
10. Monaughty, Moray.
11. Kirkhill, Aberdeen.
12. Montreathmont, Angus.
13. Glen Righ, Inverness.
14. Glenduror, Argyll.
15. Glenbranter, Argyll.
16. Tentsmuir, Fife.
17. Edensmuir, Fife.
18. Glentress, Peebles.
19. Bennan, Kirkcudbright.
20. Dalbeattie, Kirkcudbright.
21. Newcastleton, Roxburgh.
22. Teindland, Moray.
23. Glenurquhart, Inverness.
24. Glenhurich, Argyll.
25. Drummond Hill, Perth.
26. Glenmore, Inverness.
27. Culloden, Inverness.
28. Nevis, Inverness.
29. Craig-nan-Eun, Inverness.
30. Ardgartan, Argyll.
31. Barcaldine, Argyll.
32. Benmore, Argyll.
33. The Bin, Aberdeen.
34. Craig Phadrig, Inverness.
35. Ordiequish, Moray.
36. Salen, Argyll.
37. North Strome, Ross.
38. South Strome, Ross.
39. Glenshiel, Ross.
40. Glenfinart, Argyll.
41. Findon, Ross.
42. Kessock, Ross.
43. Drumtochty, Kincardine.
44. Midmar, Aberdeen.
45. Kemnay, Aberdeen.
46. Glengarry, Inverness.
47. Blairadam, Fife and Kinross.
48. Deer, Aberdeen.
49. Forest of Ae, Dumfries.†
50. Eilanreach, Inverness.
51. Greskine, Dumfries.
52. Edgarhope, Berwick.
53. Fearnoch, Argyll.
54. Dornoch, Sutherland.
55. Inverinate, Ross.
56. Lennox Castle, Stirling.
57. Loch Ard, Perth.
58. Scootmore, Moray.
59. Clunes, Inverness.
60. Devilla, Fife.
61. Balblair, Sutherland.
62. Lael, Ross.
63. Clashindarroch, Aberdeen.
64. Roseisle, Moray.
65. Inglismaldie, Kincardine.
66. Blackcraig, Perth.
67. Achaglachgach, Argyll.
68. Strathyre, Perth.‡
69. Knapdale, Argyll.
70. Fiunary, Argyll.
71. Carden, Fife.
72. Glenloy, Inverness.
73. Auchenroddan, Dumfries.
74. Kirroughtree, Kirkcudbright.
75. Newtyle, Moray.
76. Durris, Kincardine.
77. Longart, Ross.
78. Garadhban, Stirling.
79. Inverinan, Argyll.
80. Glenbrittle, Isle of Skye.
81. Alltcailleach, Aberdeen.
82. Fleet, Kirkcudbright.
83. Kinfauns, Perth.
84. Kilsture, Wigtown.
85. Whitehaugh, Aberdeen.

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* Former Crown wood.
† Formerly known as Closeburn.
‡ Formerly known as Tulloch.

Table E5.—Cultural Operations (Table E, Column 5).

Year ending 30th September.	Plantations.								Nurseries	Grand Total.
	Preparation of Ground.	Drainage.	Fencing.	Planting.	Weeding and Cleaning.	Beating-up.	Forest Protection.	Total.		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	£	£	£	£	£	£	£	£	£	£
First decade :										
Five years, 1920–24	56,251	15,415	53,085	81,531	27,147	12,464	15,113	261,006	170,372	431,378
1925	16,920	10,515	20,311	22,615	22,620	9,526	9,152	111,659	52,466	164,125
1926	18,052	9,125	26,684	28,621	28,262	13,071	13,527	137,342	63,547	200,889
1927	19,522	12,496	36,354	35,928	34,528	9,310	17,744	165,882	64,661	230,543
1928	20,864	15,033	35,403	38,442	37,935	13,867	16,934	178,478	68,753	247,231
1929	20,341	18,563	32,686	36,076	33,007	11,134	23,354	175,161	61,474	236,635
Total, 1925–29 ...	95,699	65,732	151,438	161,682	156,352	56,908	80,711	768,522	310,901	1,079,423
Total, First decade ...	151,950	81,147	204,523	243,213	183,499	69,372	95,824	1,029,528	481,273	1,510,801
Second decade :										
1930	19,541	25,042	34,554	43,364	36,070	22,047	26,169	206,787	73,569	280,356
1931	17,522	29,463	38,449	43,096	35,803	19,040	27,134	210,507	75,051	285,558
1932	13,241	37,228	31,425	34,078	39,439	16,032	26,139	197,582	54,974	252,556
1933	10,307	36,563	29,748	29,105	44,113	18,729	32,187	200,752	53,611	254,363
1934	9,716	36,806	29,203	30,804	43,073	20,913	35,617	206,132	58,939	265,071
Total, 1930–34 ...	70,327	165,102	163,379	180,447	198,498	96,761	147,246	1,021,760	316,144	1,337,904
Grand Total ...	222,277	246,249	367,902	423,660	381,997	166,133	243,070	2,051,288	797,417	2,848,705
Percentage ...	*7·8*	*8·6*	*13*	*14·9*	*13·4*	*5·8*	*8·5*	*72*	*28*	*100*

Cultural Operations.—Expenditure amounted to £265,071, details of which are given in Table E5. Plantations accounted for £206,132 and nurseries £58,939.

Plantations.—The total area planted or sown during the year was 21,667 acres, of which 20,006 acres were placed under conifers and 1,661 acres under broadleaved species. Included in the above are 528 acres reafforested in the former Crown woods and 754 acres replanted after damage by fire.

The total addition to the woodland area of Great Britain as a result of the Commission's operations, was 16,286 acres. In forming plantations and beating-up previous years' plantations 53,928,000 trees were used, of which 45 per cent. were Norway and Sitka spruces; 28 per cent. Scots and Corsican pines; 14 per cent. European and Japanese larches; 2 per cent. Douglas fir, and 9 per cent. broadleaved species.

An area of 145 acres of existing woods was underplanted, necessitating the use of 138,000 plants.

The quantities of work done in the plantations during the year are shown in the table below.

Silvicultural Operations.

Division.	Planted and Sown.	Naturally Regenerated.	Underplanted.	Thinned.	Felled.
	Acres.	Acres.	Acres.	Acres.	Acres.
I	2,270	—	—	122	—
II	2,989	—	10	209	24
III	2,682	19	—	102	7
IV	866	—	3	191	102
V	2,407	—	2	156	18
VI	805	—	65	413	80
VII	378	25	4	1,209	228
England and Wales ...	12,397	44	84	2,402	459
N.	2,752	—	21	93	—
N.E. ...	2,365	—	18	347	5
S.W. ...	4,153	—	22	422	2
Scotland ...	9,270	—	61	862	7
Total	21,667	44	145	3,264	466

Forest.	Area planted (acres).					
	Afforested.		Re-afforested.		Total.	
	Conifers.	Broad-leaved.	Conifers.	Broad-leaved.	Conifers.	Broad-leaved.
Alice Holt, Hants*	—	—	10	3	10	3
Allerston, Yorks	209	5	25	24	234	29
Ampleforth, Yorks	48	—	51	7	99	7
Ampthill, Bedford	—	—	—	—	—	—
Arkengarthdale, Yorks ...	113	2	—	—	113	2
Bardney Woods, Lincoln ...	—	—	1	73	1	73
Bawtry, Notts	20	2	24	—	44	2
Beddgelert, Caernarvon ...	76	—	—	—	76	—
Bedgebury, Kent and Sussex*...	—	—	22	—	22	—
Bere, Hants*	—	—	—	10	—	10
Bodmin, Cornwall	—	—	75	—	75	—
Bourne, Lincoln and Rutland	—	—	17	34	17	34
Bramshill, Berks and Hants...	—	—	—	—	—	—
Brechfa, Carmarthen	349	7	35	—	384	7
Brecon, Brecknock	145	—	—	—	145	—
Brendon, Somerset†	5	—	43	—	48	—
Brighstone, Isle of Wight ...	—	82	—	—	—	82
Bruton, Somerset and Wilts ...	41	—	12	1	53	1
Brynmawr, Cardigan	49	—	—	—	49	—
Buriton, Hants and Sussex ...	—	52	—	—	—	52
Caio, Carmarthen	202	—	—	—	202	—
Cannock Chase, Stafford ...	105	6	51	—	156	6
Chepstow, Glos. and Monmouth.	—	—	1	—	1	—
Chiddingfold, Surrey and Sussex.	—	—	30	10	30	10
Chopwell, Durham*	—	—	14	9	14	9
Clipstone, Derby and Notts ...	159	7	35	54	194	61
Clocaenog, Denbigh and Merioneth.	396	1	—	—	396	1
Coed-y-Brenin, Merioneth§ ...	463	—	75	—	538	—
Combley, Isle of Wight ...	—	—	—	73	—	73
Crychan, Carmarthen ...	311	—	—	—	311	—
Cwmeinion, Cardigan... ...	2	—	—	—	2	—
Cynwyd, Merioneth	—	—	22	—	22	—
Dartmoor, Devon	89	—	11	—	100	—
Dean Forest, Glos., Hereford and Monmouth.*‡	—	21	83	66	83	87
Delamere, Cheshire*	—	—	23	—	23	—
Dovey, Merioneth and Montgomery.	193	—	12	—	205	—
Dunwich, Suffolk	—	—	—	—	—	—
Dyfnant, Montgomery ...	49	—	—	—	49	—
Dymock, Gloucester and Hereford.*	23	—	—	—	23	—
Eggesford, Devon	—	—	14	—	14	—
Ennerdale, Cumberland ...	121	2	—	—	121	2
Ferndown, Dorset	27	—	—	—	27	—

* Former Crown woods.

† Formerly known as Exmoor.

September, 1934—*England and Wales.*

Species planted, including beating-up (thousands).									Forest.
Scots and Corsican Pines.	Eur. and Jap. Larches.	Douglas Fir.	Norway and Sitka Spruces.	Oak.	Ash.	Beech.	Others.	Total.	
6	53	—	28	18	—	—	1	106	Alice Holt.*
160	298	—	327	—	7	33	68	893	Allerston.
32	82	—	160	—	1	6	6	287	Ampleforth.
6	—	—	—	1	—	—	3	10	Ampthill.
—	—	—	193	—	—	—	21	214	Arkengarthdale.
—	—	—	3	184	20	—	—	207	Bardney Woods.
53	31	—	69	3	—	—	1	157	Bawtry.
—	—	—	131	—	—	—	—	131	Beddgelert.
43	29	—	6	—	—	—	3	81	Bedgebury.*
—	1	—	—	20	—	2	—	23	Bere.*
36	52	33	38	—	—	2	3	164	Bodmin.
—	—	—	26	—	87	—	—	113	Bourne.
436	—	—	10	—	—	—	—	446	Bramshill.
20	186	59	348	—	—	11	5	629	Brechfa.
8	106	—	196	—	—	1	4	315	Brecon.
50	32	48	60	—	—	3	5	198	Brendon.†
32	5	—	2	—	4	226	3	272	Brighstone.
—	24	25	33	—	1	1	10	94	Bruton.
6	63	—	—	—	—	—	1	70	Brynmawr.
—	—	—	—	—	—	37	127	164	Buriton.
7	38	9	347	—	—	—	1	402	Caio.
459	81	—	220	—	—	15	19	794	Cannock Chase.
6	6	—	47	—	—	8	1	68	Chepstow.
1	1	—	73	42	10	3	—	130	Chiddingfold.
—	26	—	6	—	—	10	6	48	Chopwell.*
918	2	—	—	—	71	6	63	1,060	Clipstone.
10	190	—	660	—	—	2	22	884	Clocaenog. [in.§
5	95	71	783	—	—	1	21	976	Coed-y-Bren-
—	10	—	3	159	5	6	5	188	Combley.
41	185	16	317	—	—	—	—	559	Crychan.
—	—	—	18	—	—	—	—	18	Cwmeinion
10	57	—	6	—	—	1	—	74	Cynwyd.
—	4	1	168	—	—	—	2	175	Dartmoor.
22	139	1	129	183	13	63	22	572	Dean Forest.*‡
78	4	—	13	—	—	1	—	96	Delamere.*
5	186	128	273	—	—	1	7	600	Dovey.
92	—	—	—	10	—	—	1	103	Dunwich.
—	22	3	89	—	—	—	—	114	Dyfnant.
—	46	—	6	—	—	3	1	56	Dymock.*
—	3	20	11	—	—	1	1	36	Eggesford.
3	41	5	268	—	—	1	3	321	Ennerdale.
132	—	—	16	—	—	—	—	148	Ferndown.

§ Formerly known as Vaughan.
‡ Includes forest previously known as Chase.

Forest.	Area planted (acres).					
	Afforested.		Re-afforested.		Total.	
	Conifers.	Broad-leaved.	Conifers.	Broad-leaved.	Conifers.	Broad-leaved.
Friston, Sussex	—	54	—	—	—	54
Glasfynydd, Brecknock ...	35	—	—	—	35	—
Gwydyr, Caernarvon and Denbigh.	487	—	—	—	487	—
Hafod Fawr, Merioneth* ...	20	—	—	—	20	—
Haldon, Devon	24	—	50	—	74	—
Halwill, Devon	140	—	13	—	153	—
Hamsterley, Durham	34	3	—	—	34	3
Harwood, Northumberland ...	75	2	—	—	75	2
Haugh, Hereford	—	—	5	7	5	7
Hazelborough, Bucks and Northants.*† ...	—	5	4	17	4	22
Herodsfoot, Cornwall... ...	—	—	11	—	11	—
Hope, Derby	66	2	—	—	66	2
Kerry, Montgomery and Salop	—	—	46	—	46	—
Kershope, Cumberland ...	316	—	—	—	316	—
Kielder, Northumberland‡ ...	669	5	—	—	669	5
Laughton, Lincoln	74	12	14	2	88	14
Llanover, Monmouth... ...	82	—	—	—	82	—
Llantrisant, Glamorgan ...	6	—	—	—	6	—
Lydford, Devon	50	—	—	—	50	—
Lyminge, Kent	—	—	11	33	11	33
Margam, Glamorgan	—	—	—	—	—	—
Mathrafal, Montgomery ...	—	—	15	—	15	—
Micheldever, Hants	—	77	—	37	—	114
Mortimer, Hereford, Radnor and Salop.	5	—	234	4	239	4
Myherin, Cardigan	348	—	40	—	388	—
Mynydd Ddu, Brecknock and Monmouth.	100	—	—	—	100	—
New Forest, Hants*	—	—	113	57	113	57
Parkhurst, Isle of Wight* ...	—	—	2	14	2	14
Pembrey, Carmarthen ...	132	9	—	—	132	9
Quantocks, Somerset	—	—	4	—	4	—
Radnor, Radnor	64	—	1	—	65	—
Redesdale, Northumberland ...	291	—	—	—	291	—
Rendlesham, Suffolk	235	—	—	14	235	14
Rheola, Glamorgan	317	—	68	—	385	—
Ringwood, Dorset and Hants	229	—	—	—	229	—
Rockingham, Northants ...	4	—	15	108	19	108
Rosedale, Yorks	115	2	—	—	115	2
Rothbury, Northumberland ...	—	—	—	—	—	—
Salcey, Bucks and Northants*	—	—	—	7	—	7
Selby, Yorks	—	—	—	—	—	—
Sherwood, Notts	—	—	—	—	—	—
Slaley, Northumberland ...	75	—	—	—	75	—
Swaffham, Norfolk	—	—	—	—	—	—
Swanton, Norfolk	109	48	36	3	145	51
Tarenig, Cardigan and Montgomery.	40	—	—	—	40	—
Thetford Chase, Norfolk and Suffolk.	784	145	204	32	988	177
Thornthwaite, Cumberland ...	40	—	—	—	40	—

* Former Crown woods. † Includes forest previously known as Brackley.
‡ Formerly known as North Tyne Valley.

September, 1934—*England and Wales*—contd.

Species planted, including beating-up (thousands).									Forest.
Scots and Corsican Pines.	Eur. and Jap. Larches.	Douglas Fir.	Norway and Sitka Spruces.	Oak.	Ash.	Beech.	Others.	Total.	
—	—	—	—	—	5	99	50	154	Friston.
—	—	—	101	—	—	—	4	105	Glasfynydd.
132	176	10	744	—	—	9	11	1,082	Gwydyr.
—	—	—	40	—	—	—	—	40	Hafod Fawr.*
130	19	46	24	—	—	1	—	220	Haldon.
—	9	1	306	—	—	—	4	320	Halwill.
28	146	6	91	—	—	—	4	275	Hamsterley.
2	—	—	156	—	—	—	4	162	Harwood.
—	5	—	4	10	1	5	—	25	Haugh.
—	32	—	5	28	2	—	—	67	Hazelborough.*†
—	1	13	1	—	—	—	—	15	Herodsfoot.
—	—	—	252	—	—	—	44	296	Hope.
—	8	41	59	—	—	—	—	108	Kerry.
—	2	—	708	—	—	1	1	712	Kershope.
59	9	—	1,039	—	—	6	22	1,135	Kielder.‡
334	4	—	91	—	—	1	13	443	Laughton.
30	177	—	125	—	—	9	2	343	Llanover.
9	48	—	35	—	—	5	13	110	Llantrisant.
24	25	15	9	—	—	—	—	73	Lydford.
15	59	8	4	—	15	62	4	167	Lyminge.
—	48	—	213	—	—	10	20	291	Margam.
—	29	1	9	—	1	—	—	40	Mathrafal.
—	—	—	—	—	3	366	8	377	Micheldever.
15	362	32	28	—	9	2	4	452	Mortimer.
—	257	51	459	—	—	—	3	770	Myherin.
—	89	35	20	—	—	—	—	144	Mynydd Ddu.
113	5	1	199	69	—	46	10	443	New Forest.*
7	4	—	3	31	1	3	4	53	Parkhurst.*
399	1	—	46	—	—	—	22	468	Pembrey.
2	12	12	37	—	—	1	—	64	Quantocks.
—	48	—	112	—	—	2	1	163	Radnor.
16	7	—	434	—	—	—	2	459	Redesdale.
553	2	—	—	—	4	15	1	575	Rendlesham.
31	395	—	439	—	1	10	28	904	Rheola.
500	43	2	44	—	—	7	1	597	Ringwood.
13	94	—	102	206	33	2	4	454	Rockingham.
20	25	3	169	—	—	3	10	230	Rosedale.
91	5	1	46	—	—	—	—	143	Rothbury.
—	—	—	—	27	—	1	—	28	Salcey.*
40	—	—	18	—	—	—	1	59	Selby.
241	11	—	8	—	—	37	21	318	Sherwood.
140	—	—	49	—	—	—	2	191	Slaley.
54	—	—	—	—	—	—	—	54	Swaffham.
84	51	106	69	65	11	—	8	394	Swanton.
—	—	—	95	—	—	—	—	95	Tarenig.
4,272	82	163	—	424	—	115	60	5,116	Thetford Chase.
12	21	6	134	—	5	2	4	184	Thornthwaite.

Plantations. Year ended 30th

Forest.	Area planted (acres).					
	Afforested.		Re-afforested.		Total.	
	Coni-fers.	Broad-leaved.	Coni-fers.	Broad-leaved.	Coni-fers.	Broad-leaved.
Tintern, Monmouth*	—	—	86	14	86	14
Walcot, Salop	—	—	36	—	36	—
Wareham, Dorset	177	—	—	—	177	—
Westbury, Hants	—	—	—	38	—	38
West Woods, Wilts	—	—	—	100	—	100
Wilsey Down, Cornwall ...	87	—	—	—	87	—
Wyre, Worcester	—	—	35	—	35	—
Yardley Chase, Bedford and Northants.	—	20	—	92	—	112
Total	8,425	571	1,729	943	10,154	1,514
By direct sowing (included above).	11	28	—	103	11	131

Plantations. Year ended

Achaglachgach, Argyll ...	74	—	—	—	74	—
Achnashellach, Ross	—	—	—	—	—	—
Alltcailleach, Aberdeen ...	4	—	148	—	152	—
Ardgartan, Argyll	264	—	—	—	264	—
Auchenroddan, Dumfries ...	26	—	—	—	26	—
Balblair, Sutherland	—	—	62	—	62	—
Barcaldine, Argyll	190	2	—	—	190	2
Benmore, Argyll	114	3	13	1	127	4
Bennan, Kirkcudbright ...	101	—	—	—	101	—
Bin (The), Aberdeen	—	—	184	8	184	8
Blackcraig, Perth	101	—	—	—	101	—
Blairadam, Fife and Kinross ...	—	—	65	—	65	—
Borgie, Sutherland	—	—	—	—	—	—
Carden, Fife	—	—	17	—	17	—
Clashindarroch, Aberdeen ...	409	3	38	—	447	3
Clunes, Inverness	159	—	—	—	159	—
Craig-nan-Eun, Inverness ...	50	—	—	—	50	—
Craig Phadrig, Inverness ...	—	—	—	—	—	—
Culbin, Moray and Nairn ...	10	—	59	—	69	—
Culloden, Inverness	—	—	112	—	112	—
Dalbeattie, Kirkcudbright ...	149	—	—	—	149	—
Deer, Aberdeen...	60	—	98	—	158	—
Devilla, Fife	11	—	47	—	58	—
Dornoch, Sutherland	—	—	—	—	—	—
Drummond Hill, Perth ...	—	10	157	3	157	13
Drumtochty, Kincardine ...	6	—	203	—	209	—
Durris, Kincardine	100	—	8	—	108	—
Edensmuir, Fife	—	—	9	—	9	—
Edgarhope, Berwick	—	—	54	—	54	—
Eilanreach, Inverness	71	—	—	—	71	—
Fearnoch, Argyll	100	—	—	—	100	—
Findon, Ross	—	—	90	—	90	—
Fiunary, Argyll	224	—	—	—	224	—
Fleet, Kirkcudbright	70	46	29	2	99	48
Forest of Ae, Dumfries† ...	178	—	—	—	178	—
Garadhban, Stirling	—	—	102	—	102	—
Glenbranter, Argyll	—	—	—	—	—	—
Glenbrittle, Isle of Skye ...	113	—	—	—	113	—
Glenduror, Argyll	100	—	—	—	100	—

* Former Crown wood. † Formerly known as Closeburn.

September, 1934—*England and Wales*—contd.

Species planted, including beating-up (thousands).									Forest.
Scots and Corsican Pines.	Eur. and Jap. Larches.	Douglas Fir.	Norway and Sitka Spruces.	Oak.	Ash.	Beech.	Others.	Total.	
62	178	10	72	24	1	28	1	376	Tintern.*
—	34	27	2	—	—	—	—	63	Walcot.
449	4	4	104	—	—	4	2	567	Wareham.
—	—	—	—	—	26	89	—	115	Westbury.
—	—	—	—	—	17	184	—	201	West Woods.
—	1	—	143	—	—	—	—	144	Wilsey Down.
4	65	—	2	—	—	1	—	72	Wyre.
—	66	—	16	270	—	31	11	394	Yardley Chase.
10,558	4,757	1,013	11,949	1,774	354	1,601	840	32,846	Total.

30*th September*, 1933—*Scotland.*

1	6	17	127	—	—	—	—	151	Achaglachgach.
1	23	—	34	—	—	3	7	68	Achnashellach.
125	117	—	6	—	—	—	7	255	Alltcailleach.
40	42	3	657	—	—	—	17	759	Ardgartan.
—	9	—	54	—	—	2	—	65	Auchenroddan.
75	52	1	11	—	—	3	11	153	Balblair.
4	22	4	272	—	—	5	30	337	Barcaldine.
9	23	2	362	—	—	—	26	422	Benmore.
—	—	—	192	—	—	—	—	192	Bennan.
136	174	—	412	—	—	4	9	735	Bin (The).
—	50	—	113	—	—	—	11	174	Blackcraig.
14	—	—	114	—	—	—	2	130	Blairadam.
5	—	—	33	—	—	—	22	60	Borgie.
—	—	—	33	—	—	—	—	33	Carden.
177	304	—	302	—	—	6	26	815	Clashindarroch.
46	42	—	209	—	—	7	8	312	Clunes.
19	12	34	33	—	—	—	24	122	Craig-nan-Eun.
5	1	—	—	—	—	—	—	6	Craig Phadrig.
351	—	—	—	—	—	—	24	375	Culbin.
128	30	—	57	—	—	1	6	222	Culloden.
36	3	1	229	—	—	—	1	270	Dalbeattie.
7	35	—	256	—	—	14	14	326	Deer.
109	27	—	1	—	—	—	—	137	Devilla.
2	1	—	7	—	—	3	6	19	Dornoch.
5	194	—	9	10	18	—	7	243	Drummond Hill.
—	263	2	44	—	—	—	43	352	Drumtochty.
—	17	4	148	—	—	2	2	173	Durris.
29	—	—	18	—	—	—	—	47	Edensmuir.
102	63	—	4	—	1	3	1	174	Edgarhope.
4	19	2	124	—	—	—	23	172	Eilanreach.
16	—	—	177	—	—	—	10	203	Fearnoch.
186	27	—	7	—	—	3	1	224	Findon.
80	70	—	275	—	—	—	27	452	Fiunary.
—	111	—	58	1	25	3	40	238	Fleet.
10	12	—	319	—	—	2	—	343	Forest of Ae.†
31	9	—	157	—	—	1	—	198	Garadhban.
10	—	—	174	—	—	—	26	210	Glenbranter.
32	22	—	165	—	—	3	14	236	Glenbrittle.
—	36	—	167	—	—	—	4	207	Glenduror.

Plantations. Year ended

Forest.	Area planted (acres).					
	Afforested.		Re-afforested.		Total.	
	Conifers.	Broad-leaved.	Conifers.	Broad-leaved.	Conifers.	Broad-leaved.
Glenfinart, Argyll	150	—	—	—	150	—
Glengarry, Inverness	214	—	2	—	216	—
Glenhurich, Argyll	261	—	—	—	261	—
Glenloy, Inverness	158	—	—	—	158	—
Glenmore, Inverness	—	—	—	—	—	—
Glen Righ, Inverness	14	—	—	—	14	—
Glenshiel, Ross...	2	—	—	—	2	—
Glentress, Peebles	268	2	3	—	271	2
Glenurquhart, Inverness ...	115	—	—	—	115	—
Greskine, Dumfries	39	4	—	—	39	4
Inchnacardoch, Inverness ...	81	—	—	—	81	—
Inglismaldie, Kincardine ...	—	—	48	2	48	2
Inverinan, Argyll	158	2	—	—	158	2
Inverinate, Ross	55	—	—	—	55	—
Inverliever, Argyll*	—	—	15	—	15	—
Kemnay, Aberdeen	16	2	—	—	16	2
Kessock, Ross	—	—	—	—	—	—
Kinfauns, Perth	74	4	—	—	74	4
Kirkhill, Aberdeen	—	—	—	—	—	—
Kirroughtree, Kirkcudbright...	273	6	—	—	273	6
Knapdale, Argyll	335	11	—	—	335	11
Lael, Ross	110	—	2	—	112	—
Lennox Castle, Stirling ...	51	—	—	—	51	—
Loch Ard, Perth	534	—	—	—	534	—
Longart, Ross	62	—	—	—	62	—
Midmar, Aberdeen	—	—	46	7	46	7
Monaughty, Moray	—	—	42	—	42	—
Montreathmont, Angus ...	—	—	53	—	53	—
Nevis, Inverness	306	—	—	—	306	—
Newcastleton, Roxburgh ...	146	—	—	—	146	—
Newtyle, Moray	—	—	50	1	50	1
North Strome, Ross	49	—	—	—	49	—
Ordiequish, Moray	—	—	33	—	33	—
Port Clair, Inverness	121	—	—	—	121	—
Ratagan, Inverness and Ross...	28	—	—	—	28	—
Roseisle, Moray	188	—	—	—	188	—
Salen, Argyll	177	—	—	—	177	—
Scootmore, Moray	126	—	71	1	197	1
Slattadale, Ross	5	—	—	—	5	—
South Laggan, Inverness ...	—	—	6	—	6	—
South Strome, Ross	103	—	—	—	103	—
Strathyre, Perth †	206	—	—	—	206	—
Teindland, Moray	—	—	50	—	50	—
Tentsmuir, Fife	86	—	14	—	100	—
Total	7,195	95	1,930	25	9,125	120
By direct sowing (included above).	45	1	—	1	45	2

Plantations. Year ended

England and Wales	8,425	571	1,729	943	10,154	1,514
Scotland...	7,195	95	1,930	25	9,125	120
Total	15,620	666	3,659	968	19,279	1,634

* Former Crown wood. † Formerly known as Tulloch.

30*th September*, 1934—*Scotland*—contd.

Species planted, including beating-up (thousands).									Forest.
Scots and Corsican Pines.	Eur. and Jap. Larches.	Douglas Fir.	Norway and Sitka Spruces.	Oak.	Ash.	Beech.	Others.	Total.	
43	1	—	285	—	—	2	18	349	Glenfinart.
27	32	—	392	—	—	—	33	484	Glengarry.
58	33	—	433	—	—	—	1	525	Glenhurich.
29	19	—	269	—	—	2	14	333	Glenloy.
321	—	—	144	—	—	—	—	465	Glenmore.
5	—	—	29	—	—	—	1	35	Glen Righ.
—	3	—	78	—	—	—	—	81	Glenshiel.
153	256	—	116	—	—	13	4	542	Glentress.
27	20	30	152	—	—	—	11	240	Glenurquhart.
31	21	—	37	—	—	1	8	98	Greskine.
18	10	47	105	—	—	1	17	198	Inchnacardoch.
59	4	6	59	—	—	3	—	131	Inglismaldie.
—	8	—	254	—	—	4	1	267	Inverinan.
2	61	—	140	—	—	6	4	213	Inverinate.
2	3	—	32	—	—	—	—	37	Inverliever.°
25	3	—	55	—	—	4	5	92	Kemnay.
2	6	12	2	—	—	—	—	22	Kessock.
—	46	—	70	—	—	7	—	123	Kinfauns.
9	2	—	23	—	—	1	4	39	Kirkhill.
122	58	—	250	—	1	6	13	450	Kirroughtree.
15	117	6	430	—	11	7	49	635	Knapdale.
78	112	3	87	—	—	6	11	297	Lael.
6	—	—	78	—	—	1	4	89	Lennox Castle.
151	62	26	863	—	—	2	—	1,104	Loch Ard.
11	22	2	76	—	—	—	13	124	Longart.
19	35	—	41	—	1	6	3	105	Midmar.
106	22	—	14	—	—	—	—	142	Monaughty.
125	6	—	15	—	—	—	1	147	Montreathmont.
85	65	—	389	—	—	3	24	566	Nevis.
—	3	—	316	—	—	—	—	319	Newcastleton.
100	19	—	1	—	—	—	1	121	Newtyle.
9	7	—	87	—	—	10	3	116	North Strome.
36	6	—	29	—	—	—	16	87	Ordiequish.
24	7	14	180	—	—	—	43	268	Port Clair.
—	4	—	100	—	—	11	20	135	Ratagan.
584	—	—	3	—	—	—	4	591	Roseisle.
20	7	—	271	—	—	—	20	318	Salen.
149	51	1	224	—	—	7	—	432	Scootmore.
2	4	—	31	—	—	—	7	44	Slattadale.
—	—	—	10	—	—	2	2	14	South Laggan.
—	33	—	171	—	—	8	8	220	South Strome.
109	11	—	301	—	—	—	3	424	Strathyre.†
25	11	—	34	—	—	—	57	127	Teindland.
244	2	—	33	—	—	15	29	323	Tentsmuir.
4,626	3,008	217	12,069	11	57	193	901	21,082	Total.

30*th September*, 1934—*Summary.*

10,558	4,757	1,013	11,949	1,774	354	1,601	840	32,846	England & Wales.
4,626	3,008	217	12,069	11	57	193	901	21,082	Scotland.
15,184	7,765	1,230	24,018	1,785	411	1,794	1,741	53,928	Total.

Cost of Planting.—The outlay per acre on labour and material on the areas planted between 1919 and 1934 was as follows :—

	£	s.	d.
England and Wales ...	9	7	0
Scotland	9	14	11
Great Britain	9	9	11

These figures cover the cost of preparation of ground, drainage, fencing, plants, planting, replacement of failures and weeding, but do not include expenditure on forest protection, supervision and overhead charges.

Nurseries.—The total area under nurseries at 30th September, 1934, was 802 acres stocked with 141 million seedlings and 86 million transplants. Comparative figures for the three years 1932-34 are given in the following table :—

Nurseries.

Year ending 30th Sept.	Country.	Seed Sown (lb.).			Stock of Plants at 30th September (thousands).					
					Transplants.			Seedlings.		
		Coniferous.	Broad-leaved.	Total.	Coniferous.	Broad-leaved.	Total.	Coniferous.	Broad-leaved.	Total.
1934...	England and Wales.	5,727	147,382	153,109	48,675	4,314	52,989	71,715	17,322	89,037
	Scotland ...	3,067	3,523	6,590	32,759	472	33,231	50,494	1,389	51,883
	Total ...	8,794	150,905	159,699	81,434	4,786	86,220	122,209	18,711	140,920
1933...	England and Wales.	4,321	79,244	83,565	40,149	4,510	44,659	76,069	5,572	81,641
	Scotland ...	1,949	508	2,457	32,417	962	33,379	57,306	607	57,913
	Total ...	6,270	79,752	86,022	72,566	5,472	78,038	133,375	6,179	139,554
1932...	England and Wales.	2,426	22,538	24,964	42,885	4,490	47,375	122,342	7,305	129,647
	Scotland ...	2,126	1,056	3,182	34,637	799	35,436	85,497	1,214	86,711
	Total ...	4,552	23,594	28,146	77,522	5,289	82,811	207,839	8,519	216,358

Details showing by Divisions the utilisation of nursery area are as follows :—

Utilisation of Nursery Area.

Division.	Seedbeds.	Lines.	Fallow and Green Crops.	Other.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.
I ...	12·1	45·9	7·9	7·3	73·2
II ...	20·8	34·8	11·8	11·4	78·8
III ...	12·8	17·8	12·5	7·2	50·3
IV ...	17·6	16·4	4·7	6·6	45·3
V ...	46·7	71·8	18·8	26·1	163·4
VI ...	13·0	21·8	0·6	1·8	37·2
VII ...	11·3	20·3	5·7	5·7	43·0
England and Wales ...	134·3	228·8	62·0	66·1	491·2
N. ...	9·6	34·5	26·3	14·7	85·1
N.E. ...	19·7	34·4	43·1	24·4	121·6
S.W. ...	20·8	61·6	11·9	9·8	104·1
Scotland ...	50·1	130·5	81·3	48·9	310·8
Total	184·4	359·3	143·3	115·0	802·0

Seed Supply.—There was a serious shortage of Sitka spruce seed; the 1933 crop in Canada practically failed and only a small supply of seed was forthcoming from the United States of America. Sufficient seed of Japanese larch was obtained from Japan. On the Continent, Norway spruce and European larch seed was plentiful and Corsican pine was in abundant supply. As regards home-collected seed, in England and Wales Scots pine was of exceptionally good quality and sufficient quantities of oak, chestnut and sycamore were obtained to meet requirements. Although there were indications of a good mast year, the yield of fertile beech seed was poor while ash was practically a complete failure. In Scotland there were plentiful supplies of European larch and beech.

The quantity of seed sold during the year amounted to 244 lb.

The Commissioners have to express their thanks for gifts of seed from the Forest Authorities of Chile, Portugal, Rumania and the United States.

Forest Fires.—Drought conditions were again experienced in 1934 and there were 500 outbreaks of forest fires, causing damage to the extent of £12,166. This is less than the previous year when

there were 621 outbreaks and the damage done was valued at £19,040. Comparative figures for the six years 1929 (drought year) to 1934 are given below.

	1929.	*1930.*	*1931.*	*1932.*	*1933.*	*1934.*
Number of fires ...	409	165	213	315	621	500
Area burnt (acres) ...	4,574	258	171	262	1,297	741
Damage valued at ...	£45,961	£2,080	£2,143	£2,813	£19,040	£12,166

Claims amounting to £1,493 have been lodged by the Commissioners in respect of the damage done during the year.

The following table gives the causes of fires in 1934 and it will be seen that 277 (55 per cent.) originated in sparks from railway engines and 88 (18 per cent.) were caused by the general public. In all cases, except incendiarism, carelessness is the factor against which it is most difficult to take effective precautions.

Origin.	*Number of fires.*	*Percentage of total number.*
Railways	277	55
General public :		
From public roads, etc. ...	59	12
Other	29	6
Adjoining land	56	11
Incendiarism	13	3
Road engines	12	2
Commission's employees	8	2
Other ...	5	1
Unknown ...	41	8
Totals	500	100

Estate Management.—An analysis of the rentals by Divisions is given in the table on page 85.

Division.	Agricultural—£20 rent or less.		Agricultural—over £20 rent.		Foresters' etc., Houses.		Cottages.		Residential properties and Sporting.		Easements, Permissions, etc.		Total.	
	No.	Rental.	No.	Rental.	No.	Rental.	No.	Rental.	No.	Rental.	No.	Rental.	No.	Rental.
		£		£		£		£		£		£		£
I ...	34	232	45	7,575	11	—	24	160	29	1,709	48	359	191	10,035
II ...	155	1,146	107	5,564	13	—	22	145	40	1,077	54	168	391	8,100
III ...	44	245	46	2,167	9	—	5	31	32	262	26	101	162	2,806
IV ...	21	179	12	458	12	—	16	185	30	2,058	71	202	162	3,082
V ...	62	300	17	1,464	17	—	60	674	37	1,668	31	239	224	4,345
VI ...	17	93	12	1,119	26	—	14	104	71	3,595	1,198	768	1,338	5,679
VII ...	88	484	11	491	14	—	122	1,085	29	633	460	1,597	724	4,290
England and Wales ...	421	2,679	250	18,838	102	—	263	2,384	268	11,002	1,888	3,434	3,192	38,337
N. ...	107	535	21	1,150	16	90	48	229	46	1,580	69	194	307	3,778
N.E. ...	52	343	37	3,103	17	30	29	176	50	3,015	38	94	223	6,761
S.W. ...	104	748	87	6,602	18	60	84	460	80	4,003	144	1,128	517	13,001
Scotland ...	263	1,626	145	10,855	51	180	161	865	176	8,598	251	1,416	1,047	23,540
Total ...	684	4,305	395	29,693	153	180	424	3,249	444	19,600	2,139	4,850	4,239	61,877

Subhead F—Advances for Afforestation Purposes.

Expenditure £16,450.

Grants to private individuals and local authorities for planting and scrub-clearing amounted to £11,894, advances in respect of a proceeds-sharing scheme to £1,576 and overhead and supervisory charges to £2,980. The grants were as follows :—

(1) *Conifers.*—Up to £2 per acre planted and thereafter maintained as a forest crop.

(2) *Hardwoods.*—For every acre planted with approved species and thereafter maintained as an area for the production of hardwoods :—up to £4 per acre for oak or ash; £3 per acre for beech, sycamore or chestnut, and £2 per acre for other approved species.

The grant for clearance of scrub has been discontinued.

The number of schemes in respect of which grants were paid during the year and the areas dealt with are stated below :—

—	England & Wales.	Scotland.	Total.
Number of Schemes ...	237	87	324
	Acres.	Acres.	Acres.
Planting conifers ...	2,386	2,052	4,438
Planting hardwoods ...	959	16	975
Scrub clearing	8	30	38

The area planted under the proceeds-sharing scheme was 172 acres.

The following table gives, by Divisions, details as to the numbers, acreage, etc., of grant schemes which were first inspected during the year :—

Division.	Number of Schemes.	Area.	Payments certified.
		Acres.	£
I	68	705	1,421
II	33	616	1,088
III	22	350	549
IV	58	716	1,316
V	18	309	777
VI	17	192	335
VII	9	72	160
England and Wales	225	2,960	5,646
N. ...	11	421	631
N.E. ...	39	829	1,241
S.W. ...	39	585	877
Scotland	89	1,835	2,749
Total	314	4,795	8,395

Subhead G—Education. Expenditure: Gross £8,058; Net £8,024.

Details of expenditure are given in Table G.

Table G.—Education.

Year ending 30th September.	Expenditure (Table IIa, Column 4).							Income.	Net Expenditure.
	Superior Supervision and Overhead Charges.	Apprentices' Schools.				Grants to Institutions.	Total.		
		Salaries and Expenses of Instructors.	Purchase and Rent of Land and Buildings.	Allowances to Apprentices.	Stores, Fuel, Light, etc.				
	£	£	£	£	£	£	£	£	£
First decade:									
Five years, 1920-24	7,238	10,690	5,371	11,144	8,910	9,157	52,510	1,889	50,621
1925	1,240	1,150	166	1,685	931	4,743	9,915	435	9,480
1926	1,361	1,138	235	2,347	1,280	4,239	10,600	17	10,583
1927	1,231	769	185	2,028	1,122	4,135	9,470	68	9,402
1928	1,005	803	109	2,303	971	4,235	9,426	9	9,417
1929	1,050	851	129	2,202	978	4,182	9,392	9	9,383
Total, 1925-29	5,887	4,711	824	10,565	5,282	21,534	48,803	538	48,265
Total, First decade	13,125	15,401	6,195	21,709	14,192	30,691	101,313	2,427	98,886
Second decade:									
1930	900	820	838	2,203	1,215	4,232	10,208	263	9,945
1931	880	759	1,949	2,143	1,450	4,230	11,411	64	11,347
1932	789	882	259	1,982	968	4,004	8,884	5	8,879
1933	1,010	980	188	1,473	719	3,856	8,226	38	8,188
1934	1,148	1,072	270	1,163	623	3,782	8,058	34	8,024
Total, 1930-34	4,727	4,513	3,504	8,964	4,975	20,104	46,787	404	46,383
Grand Total ...	17,852	19,914	9,699	30,673	19,167	50,795	148,100	2,831	145,269
Percentage ...	*12·1*	*13·4*	*6·6*	*20·7*	*12·9*	*34·3*	*100*		

Apprentices' Schools: Expenditure, £3,128.—Thirty forest apprentices underwent courses of instruction at Parkend (Forest of Dean) and Benmore (Argyllshire). Of those who completed the two years' course 12 were granted certificates of proficiency.

Grants to Universities, Colleges, etc.: Expenditure, £1,882.—Grants were made to the following during the year:—Oxford University; Cambridge University; University College of North Wales, Bangor; Armstrong College, Newcastle-on-Tyne; Aberdeen University; Edinburgh and East of Scotland College of Agriculture; Royal Scottish Forestry Society.

The number of students studying forestry at the Universities was 115; 45 forestry degrees were granted and four candidates obtained diplomas.

Imperial Forestry Institute: Expenditure, £1,900.—The annual grant to the Imperial Forestry Institute from the Forestry Fund was continued. Twenty-one students attended for the whole or part of the year, comprising 8 post-graduate probationers from the Colonial Services, 11 forest officers on leave (India 3, Dominion Services 3, Colonial Services 5) and 2 private students.

Subhead H—Research and Experiment. Expenditure: Gross, £11,301; Net, £10,881.

Details of expenditure are given in Table H.

Table H.—Research and Experiment.

Year ending 30th September.	Expenditure (Table IIa, Column 5).					Income.	Net Expenditure.
	Superior Supervision and Overhead Charges.	Salaries and Expenses.	Labour, Stores, etc.	Grants to Institutions.	Total.		
	£	£	£	£	£	£	£
First decade :							
Five years, 1920–24	6,450	20,486	4,453	3,093	34,482	586	33,896
1925	1,662	3,030	1,112	600	6,404	43	6,361
1926	1,492	3,336	1.946	663	7,437	110	7,327
1927	1,376	3,492	2,712	757	8,337	93	8,244
1928	1,584	3,682	4,758	745	10,769	93	10,676
1929	1,135	4,432	5,249	1,405	12,221	133	12,088
Total, 1925–29 ...	7,249	17,972	15,777	4,170	45,168	472	44,696
Total, First decade ...	13,699	38,458	20,230	7,263	79,650	1,058	78,592
Second decade :							
1930	1,316	5,079	4,529	1,414	12,338	105	12,233
1931	1,292	5,323	4,588	1,395	12,598	278	12,320
1932	1,149	5,329	4,452	1,396	12,326	42	12,284
1933	1,233	5,294	4,009	1,646	12,182	78	12,104
1934	1,181	4,911	3,804	1,405	11,301	420	10,881
Total, 1930–34 ...	6,171	25,936	21,382	7,256	60,745	923	59,822
Grand Total	19,870	64,394	41,612	14,519	140,395	1,981	138,414
Percentage ...	*14·2*	*45·9*	*29·6*	*10·3*	*100*		

Investigations in nurseries and plantations have been continued and satisfactory progress has been made in the sphere of forest protection. Nine new sample plots were established including two plots in hybrid larch at Dunkeld in Perthshire, for permission to measure which the Commissioners are indebted to His Grace the Duke of Atholl. Re-measurements have been carried out in 32 sample plots and numerous data collected in connection with an investigation on the rate of branch spread of young conifers.

The Commissioners have made a grant to the Macaulay Institute for Soil Research at Craigiebuckler near Aberdeen for the investigation of forest soils including questions relating to the fertility of forest tree nurseries.

Forest Utilisation.—Material has been supplied to the Forest Products Research Laboratory for a trial of railway sleepers cut from timber of home-grown Douglas fir. This forms part of a joint project, involving the Laboratory and the Railway Clearing House, for a practical test of the effect of different methods of impregnating sleepers manufactured from home-grown timbers.

Subhead J—Agency and Advisory Services. Expenditure: Gross, £997; Net, £939.

No direct expenditure was incurred under this head. The sum of £997 is an apportionment of overhead and supervisory charges in respect of the time of various officers of the Commission who have been engaged in answering enquiries and advising woodland owners as to the treatment of their woods.

Subhead K—Special Services. Expenditure: Gross, £2,453; Net, £2,447.

Details of expenditure are given in Table K.

Table K.—Special Services.

Year ending 30th September.	Expenditure (Table IIa, Column 7).						Income.	Net Expenditure.
	Superior Supervision and Overhead Charges.	Consultative Committees' Expenses.	Publications.	Special Enquiries.	Relief of Unemployment.	Total.		
First decade:	£	£	£	£	£	£	£	£
Five years, 1920–24	10,760	349	1,634	3,571	19,828	36,142	278	35,864
1925 ...	3,226	50	78	4,824	—	8,178	36	8,142
1926 ...	3,052	32	74	1,251	—	4,409	—	4,409
1927 ...	2,740	13	43	355	—	3,151	—	3,151
1928 ...	4,503	33	45	1,177	—	5,758	19	5,739
1929 ...	2,304	46	121	1,190	—	3,661	14	3,647
Total, 1925–29	15,825	174	361	8,797	—	25,157	69	25,088
Total, First decade	26,585	523	1,995	12,368	19,828	61,299	347	60,952
Second decade:								
1930 ...	1,822	60	68	147	—	2,097	—	2,097
1931 ...	1,478	32	126	255	—	1,891	8	1,883
1932 ...	1,684	25	87	561	—	2,357	2	2,355
1933 ...	1,598	7	28	466	—	2,099	—	2,099
1934 ...	1,591	1	116	745	—	2,453	6	2,447
Total, 1930–34	8,173	125	425	2,174	—	10,897	16	10,881
Grand Total	34,758	648	2,420	14,542	19,828	72,196	363	71,833
Percentage	*48·1*	*0·9*	*3·4*	*20·1*	*27·5*	*100*		

Exhibits at Agricultural Shows.—Forestry exhibits were sent by the Commissioners to the Shows of the Royal Agricultural Society at Ipswich and the Highland and Agricultural Society at Glasgow.

Consultative Committees.—The Commissioners regret to report the deaths of Col. B. J. Petre of the English Committee and Lt.-Col. W. N. Jones of the Welsh Committee. During the year Sir Robert Greig resigned from the Scottish Committee and Mr. P. R. Laird was appointed a member in his stead.

Subhead L—Forest Workers' Holdings. Expenditure, £21,417; Income, £17,372.

Total expenditure was £1,980 greater than in 1933, due to an increase on purchase and rent of land and buildings. Erection of new buildings, adaptations and repairs together show a decrease of £3,690. Details are given in Table L.

Thirty-five holdings were completed during the year making the total number at September 30th, 1,233.

Table L.—Forest Workers' Holdings.

Year ending 30th September.	Expenditure (Table IIa, Column 8).								Income (Table IIa, Column 11).			Net Expenditure.
	Superior Supervision and Overhead Charges. (1)	Purchase and Rent of Land and Buildings. (2)	Buildings. New. (3)	Buildings. Adaptations. (4)	Buildings. Repairs. (5)	Fencing, Drainage, etc. (6)	Miscellaneous. (7)	Total. (8)	Rents. (9)	Other. (10)	Total. (11)	(12)
	£	£	£	£	£	£	£	£	£	£	£	£
First decade: Five years, 1920–24	831	5,000	—	75	—	—	—	5,906	—	8	8	5,898
1925	3,668	27,356	16,069	7,415	23	620	1,371	56,522	876	381	1,257	55,265
1926	5,372	23,353	37,519	7,130	441	2,136	—114	75,837	3,266	108	3,374	72,463
1927	8,221	9,058	54,632	4,959	744	3,942	968	82,524	5,889	185	6,074	76,450
1928	8,779	31,394	41,188	7,480	1,167	4,571	1,301	95,880	7,716	500	8,216	87,664
1929	9,023	7,779	42,776	5,243	1,507	6,292	594	73,214	8,514	72	8,586	64,628
Total, 1925–29 ...	35,063	98,940	192,184	32,227	3,882	17,561	4,120	383,977	26,261	1,246	27,507	356,470
Total, First decade	35,894	103,940	192,184	32,302	3,882	17,561	4,120	389,883	26,261	1,254	27,515	362,368
Second decade: 1930	11,196	34,410	43,126	10,932	2,536	5,902	473	108,575	12,119	87	12,206	96,369
1931	11,054	17,437	54,095	15,435	3,528	6,713	758	109,020	13,568	15	13,583	95,437
1932	9,157	3,974	26,635	4,352	6,696	4,511	1,032	56,357	16,781	30	16,811	39,546
1933	7,632	(cr.) 1,101*	4,375	3,166	3,424	1,004	937	19,437	17,145	83	17,228	2,209
1934	7,480	4,546	2,064	2,285	2,926	1,238	878	21,417	17,278	94	17,372	4,045
Total, 1930–34 ...	46,519	59,266	130,295	36,170	19,110	19,368	4,078	314,806	76,891	309	77,200	237,606
Grand Total ...	82,413	163,206	322,479	68,472	22,992	36,929	8,198	704,689	103,152	1,563	104,715	599,974
Percentage ...	*11·7*	*23·2*	*45·8*	*9·7*	*3·2*	*5·2*	*1·2*	*100*	*98·5*	*1·5*	*100*	

* Credit entry due to transfer to forestry operations of land and buildings not required for holdings.

Subhead Z—Income, £181,022.

Total income was £25,683 greater than in 1933. Sales of land and buildings increased by £7,795, rents and royalties by £2,993, sales of forest produce by £8,572 and " other " income from forestry operations by £5,831. Details are given in Table Z.

Table Z.—Income.

Year ending 30th September.	Forestry Operations.					Forest Workers' Holdings (Rents, etc.).	Miscellaneous.	Grand Total.
	Sales of Land and Buildings.	Rents and Royalties.	Forest Produce.	Other.	Total.			
	£	£	£	£	£	£	£	£
First decade : Five years, 1920-24	12,579	42,902	96,753	40,407	192,641	8	4,601	197,250
1925	23,626	39,367	54,862	16,389	134,244	1,257	850	136,351
1926	16,395	42,086	44,005	19,698	122,184	3,374	727	126,285
1927	3,417	45,483	72,111	14,375	135,386	6,074	379	141,839
1928	15,551	49,116	72,552	16,502	153,721	8,216	185	162,122
1929	7,216	55,137	66,311	15,268	143,932	8,586	194	152,712
Total, 1925-29	66,205	231,189	309,841	82,232	689,467	27,507	2,335	719,309
Total, First decade	78,784	274,091	406,594	122,639	882,108	27,515	6,936	916,559
Second decade :								
1930	2,642	65,184	63,949	16,219	147,994	12,206	406	160,606
1931	15,568	71,930	56,768	20,802	165,068	13,583	386	179,037
1932	7,869	70,249	49,477	16,621	144,216	16,811	77	161,104
1933	4,463	75,127	47,821	11,030	137,941	17,228	170	155,339
1934	12,258	78,120	55,893	16,861	163,132	17,372	518	181,022
Total, 1930-34	42,800	360,610	273,408	81,533	758,351	77,200	1,557	837,108
Grand Total	121,584	634,701	680,002	204,172	1,640,459	104,715	8,493	1,753,667
Percentage	*6·9*	*36·2*	*38·8*	*11·6*	*93·5*	*6*	*0·5*	*100*

Rents and royalties include £16,843 from the Forest of Dean mines ; " other " income includes sales of live stock £8,787 (£5,107 more than in 1933) and miscellaneous estate, farm and forest receipts £5,767.

Employment in the Commission's Forests.

The number of manual workers employed in the Commission's forests is stated in the table below :—

Summer (Minimum).		Winter (Maximum).	
1920	210	1920–21	935
1921	495	1921–22	1,780
1922	525	1922–23	1,775
1923	880	1923–24	2,220
1924	1,620	1924–25	2,650
1925	1,980	1925–26	2,960
1926	2,335	1926–27	3,185
1927	2,735	1927–28	3,495
1928	2,740	1928–29	3,565
1929	2,640	1929–30	3,835
1930	3,130	1930–31	3,850
1931	2,830	1931–32	3,505
1932	2,720	1932–33	3,985
1933	2,845	1933–34	3,735
1934	3,015	1934–35	4,020

(Signed) R. L. ROBINSON (*Chairman*).
F. D. ACLAND.
G. L. COURTHOPE.
D. R. GRENFELL.
A. RODGER.
W. R. SMITH.
S. STRANG STEEL.
W. STEUART-FOTHRINGHAM.
JOHN SUTHERLAND.

A. G. HERBERT,
Secretary,
9, Savile Row,
London, W.1.

APPENDIX I.

Imports of Timber, Wood Manufactures and Pulp of Wood.

Statistics relating to these imports are given in the following table, the figures in each case being for the calendar year.

The quantity of unmanufactured timber imported during 1934 was 11,096,000 loads, an increase of 1,523,000 loads (15·9 per cent,) over the previous year. The value, £39,570,000 was £9,708,000 (32·5 per cent.) more than in 1933. Sawn softwoods rose by 698,000 loads (12·5 per cent.) and planed or dressed softwoods by 169,000 loads (20·3 per cent.). In both classes of softwoods the rise in value was considerably greater than the rise in quantity: the value of sawn softwoods rose by 26·6 per cent., and that of planed or dressed softwoods by 31 per cent. Sawn hardwoods showed an increase of 126,000 loads (23·6 per cent.) in quantity, and of £1,252,000 (29·9 per cent.) in value. The imports of pitprops rose to 2,279,000 loads, value £3,258,000, an increase of 17·4 per cent. both in quantity and value.

Imports of wood manufactures, valued at £5,589,000, were 9 per cent. higher than in 1933.

The quantity of pulp of wood imported rose from 1,939,000 tons to 2,244,000 tons, an increase of 15·7 per cent. The value rose by 21·2 per cent., from £7,941,000 to £9,628,000.

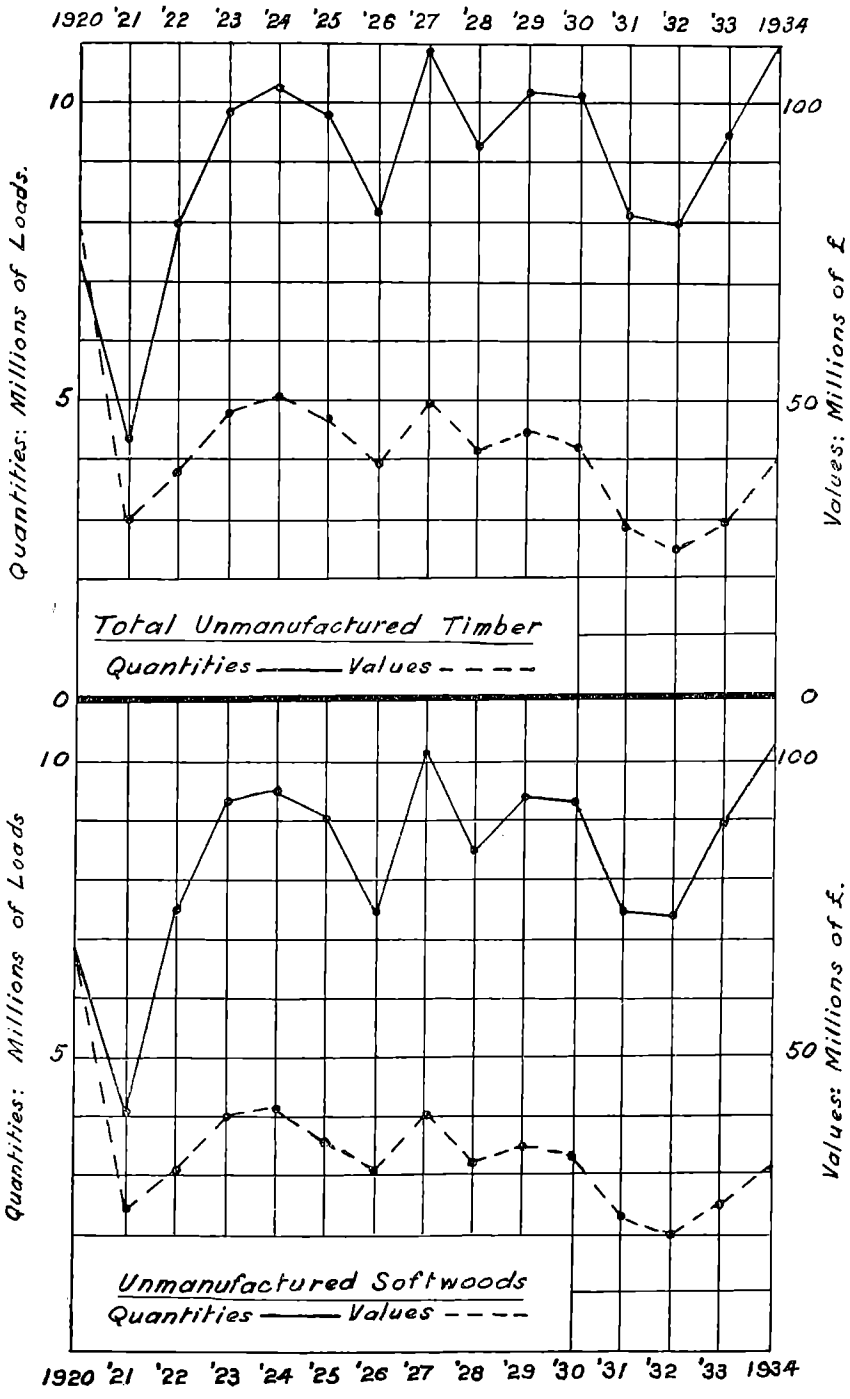
Imports of Timber, Wood Manufactures and Pulp of Wood.

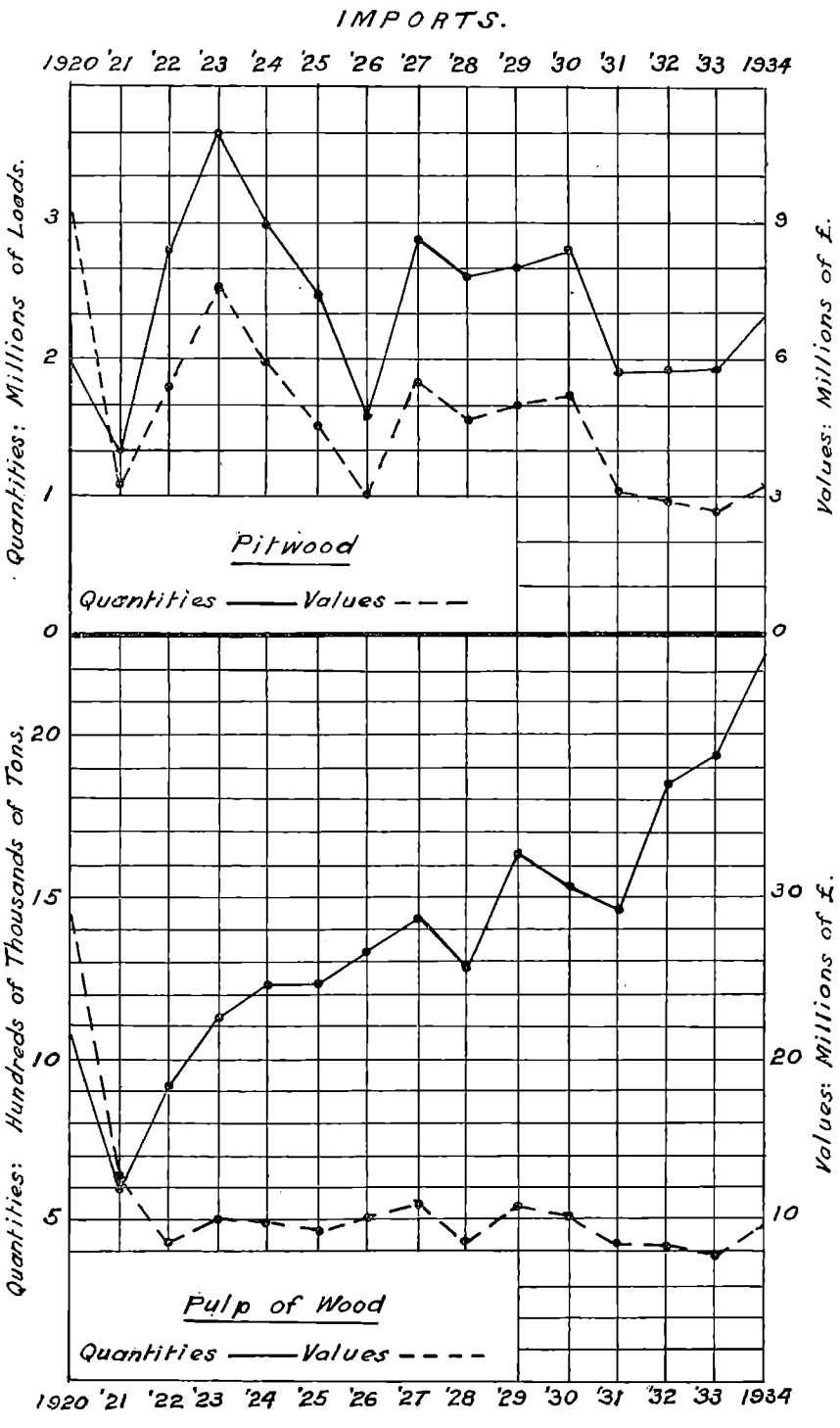
Description.	Quantities (thousands).				Value (thousands).			
	Average 1909-13.	Average 1914-18.	1933.	1934.	Average 1909-13.	Average 1914-18.	1933.	1934.
TIMBER.								
Hewn-hard—	Loads.*	Loads.*	Loads.*	Loads.*	£	£	£	£
Mahogany ...	—	—	14	26	—	—	126	233
Walnut ...	—	—	2	56	—	—	14	432
Oak	—	—	3		—	—	24	
Teak	—	—	1		—	—	11	
Other sorts ...	—	—	34		—	—	260	
Hewn-soft (fir, pine, spruce, etc.).	542	129	336	406	1,353	583	608	624
Sawn-hard—								
Mahogany ...	—	—	13	16	—	—	168	232
Walnut ...	—	—	4	6	—	—	71	97
Oak	—	—	207	217	—	—	1,737	1,916
Teak	—	—	16	31	—	—	310	546
Other sorts ...	—	—	293	389	—	—	1,904	2,651
Sawn-soft, other than planed or dressed.	—	—	5,594	6,292	—	—	17,161	21,731
Planed or dressed.	—	—	832	1,001	—	—	3,412	4,470
Other descriptions—								
Pitprops ...	2,944	1,673	1,941	2,279	3,510	4,425	2,775	3,258
Staves ...	161	71	43	63	795	648	228	334
Sleepers ...	—	130	231	302	—	602	598	940
Veneers and panel wood.	—	—	9	12	—	—	455	741
Not elsewhere specified.	6,557†	3,550†	—	—	21,903†	24,362†	—	1,365
Total unmanufactured timber.	10,204	5,553	9,573	11,096	27,561	30,620	29,862	39,570
WOOD MANUFACTURES.								
Furniture and cabinet ware.	—	—	—	—	416	115	313	386
Builders' woodwork (window frames, doors, etc.).	—	—	—	—	180	62	971	1,165
Plywood ...	—	—	—	—	—	—	1,848	2,742
Tool handles ...	—	—	—	—	—	—	86	1,296
Domestic woodwork (bread platters, trays, etc.).	—	—	—	—	—	—	167	
Not elsewhere specified.	—	—	—	—	2,099	1,821	1,742	
Total manufactured timber.	—	—	—	—	2,695	1,998	5,127	5,589
PULP OF WOOD.								
Pulp of wood ...	Tons. 859	Tons. 682	Tons. 1,939	Tons. 2,244	4,058	7,915	7,941	9,628

* Load = 50 cu. ft.

† These figures apply mainly to sawn softwoods. It is not possible to differentiate according to the various categories enumerated above owing to a change in the Board of Trade classification from 1920 onwards.

IMPORTS


1920 '21 '22 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33 1934
10
5
0
100
50
0
Quantities: Millions of Loads.
Values: Millions of £
Total Unmanufactured Timber
Quantities ——— Values - - - -
10
5
100
50
Quantities: Millions of Loads
Values: Millions of £.
Unmanufactured Softwoods
Quantities ——— Values - - - -
1920 '21 '22 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33 1934


IMPORTS.
1920 '21 '22 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33 1934
Quantities: Millions of Loads.
Values: Millions of £.
Pitwood
Quantities —— Values - - -
Quantities: Hundreds of Thousands of Tons.
Values: Millions of £.
Pulp of Wood
Quantities —— Values - - - -
1920 '21 '22 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33 1934

APPENDIX II.

Production of Hardwoods.

Composition of British Woodlands.

The Census of Woodlands, 1924,* showed that the areas under different types of forest in Great Britain were, to the nearest thousand acres, as follows:—

	Acres.	Acres.
Conifers	... 672,000	
Hardwoods	... 443,000	
Mixed hardwoods and conifers	... 302,000	
Total High Forest ...	...	1,417,000
Coppice and coppice with standards		529,000
Total Economic Woodlands	...	1,946,000
Amenity, shelter belts, etc.		204,000
		2,150,000
Scrub, felled or devastated ...		809,000
Total	...	2,959,000

The production of hardwood saw-timber is mainly from the woodlands classified above as "hardwoods". "Mixed hardwoods and conifers", "coppice with standards" and "amenity", as well as hedgerows (not included in the enumeration), also contribute to the supply. The total amount felled or sold for felling in 1924 was 14·6 million cubic feet valued at £923,000 standing, 11·8 million cubic feet being in England, 1·3 million cubic feet in Wales and 1·5 million cubic feet in Scotland. A rough analysis of the data from which the Census of Production figures were derived indicates that of the total volume 50 per cent. was obtained from the hardwood areas, 12 per cent. from the "mixed", 27 per cent. from the coppice with standards and amenity woods and 11 per cent. from hedgerows.

Further, of the total volume 80 per cent. came from England and 10 per cent. each from Scotland and from Wales.

In considering the maintenance of the home-grown hardwood supply it seems unlikely that any appreciable part of the woodland area at present under conifers will be planted with broadleaved species. The future therefore is bound up with the treatment of the categories of woodland mentioned in the second paragraph and with the possibility of afforesting land at present bare.

The Future of Woodlands now producing Hardwood Timber.

Viewed as an economic forestry problem continuity in supply of hardwoods from the existing woodlands rests mainly with the existing "hardwood" areas. "Mixed hardwoods and conifers" is not a good method of growing hardwoods unless the conifers are removed in good time leaving the hardwoods to form the final crop, in which case the area automatically becomes "hardwood". Frequently the necessary thinnings are not made in time, the hardwoods do not develop satisfactorily and the final value of the crop lies mainly in its softwood contents. The growing of standards in coppice

* *Report on Census of Woodlands and Census of Production of Home-grown Timber*, 1924. (H.M. Stationery Office.) Certain aspects of this and kindred questions are there discussed in greater detail.

was at one time very well managed in England, but for various reasons the system has become almost obsolete, so that standards are not now "stored" on anything approaching the former scale. Amenity woods, shelter belts, etc., are definitely classed as uneconomic woodlands because primarily they serve other ends than timber production.

If the age classes of the existing woodlands are examined it will be found that there has been a remarkable decrease in the planting of hardwoods over the last century or so. The figures in the table below illustrate the point, and though the decade 1915-1924 was, of course, quite abnormal it is clear that the tendency, so far as it applies to private woods, has not been reversed.

Average Area planted Annually.

	1845-1884	1885–1904	1905–1914	1915–1924
	Acres.	Acres.	Acres.	Acres.
Hardwoods	4,500	2,000	1,000	500
Mixed hardwoods and conifers	3,400	3,200	1,600	1,100
	7,900	5,200	2,600	1,600

The reasons why hardwood and mixed plantations have fallen into disfavour are numerous, but broadly the change is an expression of changing economic conditions. During the earlier decades of the 19th century oak for ship building was an important consideration. Much land (and incidentally a fair proportion unsuitable for the purpose) was planted with that species, pure or with coniferous nurses, and subsequently thinned very heavily to produce the branched trees suitable for boat building. As this market receded and the national demand for softwoods increased woodland owners gradually restricted their plantings of hardwoods. There are also other important reasons why conifers were preferred to hardwoods. The latter, and oak in particular, require better soil than conifers, the age of maturity is frequently twice as great, the expense of forming the plantation is greater as is also the cost of protecting it in the early stages against weeds, the thinnings are longer delayed and often of smaller value: thus all the inducements to the private owner were (and continue to be) to plant conifers rather than hardwoods.

When all the facts stated above are taken into consideration the conclusion is irresistible that the area of privately-owned woodlands producing hardwood timbers will continue to diminish and the outturn must also diminish. To maintain the existing area of "hardwoods" alone (443,000 acres) on a rotation of 150 years it would be necessary to plant or otherwise regenerate 3,000 acres annually. The danger of serious diminution in outturn is not immediate since there are some 208,000 acres of hardwoods over 80 years old. Indeed the outturn may increase considerably if woodland owners are forced for any reason to realise on the value of their woods. A lean time will begin when the woods now over 80 years old are cut and a leaner still when the woods now 41-80 years (180,000 acres) are gone.

The Possibility of increasing the Hardwood Area by Afforestation.

Bearing in mind the fact that hardwoods require good soil it will be realised that the possibilities in this direction are distinctly limited. The proportion of suitable land found in the uncultivated land available for afforestation is very small. In the case of mountain and heath land it is usually restricted to quite small patches.

Another source of supply is in the marginal agricultural lands and especially the heavier soils. It is at least doubtful whether wholesale afforestation would be to the general national advantage.

Possibility of increasing Production per Acre.

So far consideration has been paid only to the hardwood *area* without reference to the volume of timber produced per acre. It is a fact that British hardwood areas are poorly stocked and the trees short-boled and defective compared with good French and German forests. Mature oak woodlands containing more than 1,200 to 1,500 cubic feet of saw timber per acre are rare, whereas with improved methods of silviculture the soil might be made to produce at least double these quantities in the same time.

The Forestry Commissioners' Policy.

In considering the question of softwood versus hardwood planting the following considerations must be borne in mind. At the present stage of the world's industrial development the overwhelming demand is for softwoods. So far as Great Britain is concerned only some 10 per cent. of the current consumption is hardwoods. Similarly in the war the bulk of the fellings took place not in the hardwoods, which remained reasonably intact, but in the coniferous plantations both old and immature. It is necessary also to envisage the probable timber supply position at somewhat distant periods. In a general way it seems certain that the world competition for timber will be far greater in the future as regards softwoods than as regards hardwoods. The softwood position has been discussed very fully in Parliament and in the technical press from time to time, and it is unnecessary now to go into it in detail. The hardwood position may conceivably become acute in the distant future, but before real hardship was incurred many valuable tropical species would have to be worked out.

The general policy adopted by the Commissioners has been to replace as quickly as possible the coniferous plantations which disappeared as a result of the war. Consequently their plantations have, so far, been made mainly with conifers and must continue so to be if the deficit is to be made good. The hardwood question, however, has not been neglected. The steps which are being taken are described below.

The former Crown woods, amounting to some 60,000 acres, are being regenerated so far as practicable to hardwoods (oak, beech, ash and sycamore). A proportion only of the soil is suitable for oak and less still for ash, which is a very exacting species. Preference is given to those two species and then in descending order to beech, sycamore and finally to conifers. A considerable area of oak is being regenerated naturally, and with success, with that species and is not included in the areas returned as planted.

From time to time land is acquired which has carried a crop of hardwoods. As a rule such land is difficult and costly to deal with. The lop-and-top has not been cleared up, weed and coppice growth has become very rank and an important consideration is to get the area covered as soon as possible with a quick growing species. Thus part only is planted in the first instance with hardwoods and the remainder with conifers which serve as a cleaning and catch crop.

Suitable areas of bare land have also been acquired and planted or sown with hardwoods. This is a somewhat difficult operation, as hardwoods require nursing in youth, and any attempt to force the pace in planting only results in high losses of plants.

As a general rule hardwood plantations are much more difficult than conifers to establish. Not only is more skill required but far greater patience has also to be exercised. A great deal of experimental work has

been carried out and results have been obtained or are in sight which should gradually enable the Commissioners to proceed in future with large scale operations.

It has been urged that by paying a little more for land a considerably greater proportion of hardwood soil would be secured. Broadly, the statement is true, but it is also true that such action would result in the afforestation of land which more properly belongs to agriculture. The Commissioners have hitherto taken up the attitude that it is not in the national interest to do so.

More important than the afforestation of new land with hardwoods is the maintenance of the existing hardwood area which is mainly in private ownership and much of which is in small blocks and intimately associated with residential and agricultural properties. The problem of securing by State action the efficient management of private woodlands is in any event most difficult, and the possibility of restricting the user in the direction of hardwood production instead of more remunerative softwood production is even more remote. Short of compulsion the Commissioners have used the only means at their disposal by offering higher grants for planting hardwoods than for conifers. It cannot be said that the response has been satisfactory nor is there any reason to believe that increasing the grants, within any reasonable limit, would have the desired effect.

Summary.—The Commissioners consider that the most important problem immediately before them is to provide a supply of softwoods, at the same time they are not neglecting opportunities of acquiring suitable hardwood soils and concurrently they are attempting to improve methods of raising hardwood crops. The maintenance, indefinitely, of the supply of home-grown hardwoods on its present scale is unfortunately a problem to which at present they see no complete solution.

FORESTRY COMMISSION.
December, 1929.

APPENDIX III.

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