1931.

NEW ZEALAND.

STATE FOREST SERVICE.

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1931.

Presented to both Houses of Parliament pursuant to Section 64 of the Forests Act, 1921–22.

THE DIRECTOR OF FORESTRY to the Hon. the COMMISSIONER OF STATE FORESTS.

SIR,— Wellington, 1st July, 1931.

I have the honour to submit herewith the annual report of all operations of the State Forest Service for the year ended 31st March, 1931, as required by section 64 of the Forests Act, 1921–22. In doing so I desire to point out that credit for the results herein recorded must be given to my predecessor in office, Mr. E. Phillips Turner, who was in control of the Service during the whole period mentioned.

I have, &c.,
A. D. McGAVOCK,
Director of Forestry.

Hon. E. A. Ransom,
Commissioner of State Forests.

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REPORT.

INTRODUCTION.

For easy reference a few of the major activities are summarized hereunder:—

Afforestation.—Afforestation operations for the year resulted in the establishment of a gross area of 53,752 acres of new plantations, or 248 acres less than the projected programme of 54,000 acres. In round figures, the total area of exotic plantations is now 307,000 acres.

Thinning, &c.—The thinning and clearing of the older-age plantation classes, which was undertaken on an extended scale for the first time last year, were continued, and at Conical Hills (Otago) the major portion of the plantation has now been thinned. Cleaning and underscrubbing were also carried out in the older plantations of Rotorua and Canterbury Regions respectively, and it is hoped that it may be possible to extend this silvicultural treatment, so essential to the health and maximum growth of the plantations, to cover all the older-age classes not yet dealt with.

Utilization.—At the present time consideration is being given, by the preparation of working plans, to the possibility of commercially utilizing thinnings from plantations. It is hoped that a demonstration can be made of the possibility of converting these thinnings into shooks for fruit-cases and cheese-crates, &c., which will successfully compete with the imported article, and so use this hitherto-wasted product of growing plantations, and also devise a method of utilization which will ensure a higher conversion factor, a lower cost of production, and a shook at least as good in quality and appearance as the foreign product.

Forest Wild Life.—Wild animals inimical to plant and forest growth are still very numerous, and their reduction to a safe margin is a matter of grave concern; otherwise regeneration, especially in the southern-beech forests, will soon be non-existent.

As stated in Chapter I of this report, forest pests, under all heads, destroyed by the Service totalled 64,032, and the Service has official cognizance of a further 12,267 deer destroyed by private agencies, making a grand total of 76,299.

In this connection it may be mentioned that wild-life control will henceforth be administered entirely in terms of the Animals Protection and Game Act, 1921–22.

RETIREMENT OF DIRECTOR.

At the 31st March, 1931, Mr. E. Phillips Turner, F.R.G.S., relinquished the position of Director of Forestry, which he had held for the past three years.

Mr. Turner has been a life-long student of forestry and its cognate subjects generally, and New Zealand forests in particular, and during his long service with the State as land-surveyor, first Dominion Inspector of Scenic Reserves, and as Chief Forestry Officer (prior to the establishment of Forestry as a separate Department) he acquired an intimate field knowledge of our indigenous forest-life, both North and South, which has been rarely equalled and probably never surpassed.

A natural corollary to the setting-up of the new Department in 1920 was Mr. Turner's appointment as head of the Administrative Branch, and in 1928—eight years later—he succeeded Mr. L. MacIntosh Ellis as Director. Forestry sustains a severe loss by the retirement of Mr. Turner, but to Forest officers this loss is tempered by reason of the fact that his ripe experience and specialized knowledge will be available to the Department from time to time, as the Government has been pleased to accept his offer to act as Honorary Forest Adviser.

CHAPTER I.—THE STATE FORESTS.

1. Areas of State Forests as at 31st March, 1931.

Region.	State Forests.		Provisional State Forests.		Totals.	Percentage of Total Area in Region under Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	
Auckland ..	159,545	22,516	260,527	72,443	515,031	5·99
Rotorua ..	300,314	59,528	156,863	209,098	725,803	14·43
Wellington ..	799,070	..	161,603	73,784	1,034,457	6·91
Nelson ..	158,751	12,086	1,338,625	726,103	2,235,565	31·80
Westland ..	2,309	..	1,086,354	597,665	1,686,328	43·65
Canterbury ..	328,826	3,699	..	..	332,525	3·35
Southland ..	280,193	..	884,230	67,034	1,231,457	7·25
Totals ..	2,029,008	97,829	3,888,202	1,746,127	7,761,166	11·69

The area dedicated to forestry purposes now stands at 7,761,166 acres, a slight increase over last year's figures, and 11·69 per cent. of the total area of the Dominion.

The area withdrawn for land-settlement totalled 18,651 acres, of which 5,529 acres were located in Auckland, 5,007 acres in Southland, 2,669 acres in Westland, 2,426 acres in Nelson, and the remainder distributed over Rotorua, Wellington, and Canterbury Regions. The areas proclaimed comprise mainly lands taken over for afforestation, and in this respect Rotorua Region contributed 54,794 acres, and Nelson and Southland 8,496 and 6,748 acres respectively.

2. Legislation.

By section 5 of the Finance Act, 1930 (No. 2), the Minister of Finance is empowered to borrow such further amount, not exceeding £1,000,000, as he thinks fit for the purposes of the Forests Act, 1921–22.

3. Finance.

As the financial accounts of the Service on a commercial basis are published by the Treasury in parliamentary paper B.–1, Part IV, this section of the report has been confined to a review of the year's operations in the form of a Receipts and Payments Account, as under :—

Receipts.

The forest receipts for the past financial year from all sources were £84,715, a decrease of £20,922 on the figures for the previous year. Details, together with comparisons with the previous two years, are appended.

TABLE 1.

Item.	1930–31.	1929–30.	1928–29.
	£	£	£
Indigenous-forest receipts—Timber-sales	56,391	60,711	49,009
Timber royalties and trespass	3,538	6,790	7,955
Leases—Grazing	2,093	2,115	2,332
Sawmill-sites, industrial, &c.	1,636	2,850	1,339
Miscellaneous	3,723	9,685	8,804
National Endowment Account allocation	9,866	12,156	8,249
Nurseries and plantations—			
Trees and seeds	5,271	8,082	9,549
Firewood and poles	298	1,117	1,014
Miscellaneous	1,899	2,131	1,863
Totals	84,715	105,637	90,114

The main reasons for the decrease in revenue are—

(1) The depressed state of the sawmilling industry, which has resulted in the complete cessation of operations by a number of millers and the working of part time only by others.

(2) The gradual tapering-off in the sale of trees and tree-seeds to the public. (Sales of the former have now ceased altogether.)

(3) The fact that the Service's share of opossum revenue for the year has not yet been allocated. (A sum of £4,953 was received from this source during the previous year.)

Payments.

The net expenditure from the State Forests Account for the past financial year was £393,065, a detailed analysis of which is set out herein, also comparisons with the years 1928–29 and 1929–30.

TABLE 2.

Item.	1930–31.	1929–30.	1928–29.
	£	£	£
Fixed charges and staff salaries—			
Interest and loan expenses	82,809	59,884	44,189
Allocation of revenue—			
National Endowment Account	9,495	6,971	7,469
Local-body payments	10,346	11,522	7,284
Staff salaries	49,526	47,817	44,548
Management, establishment, and development—			
Indigenous forests	32,331	28,520	22,033
Fire-fighting equipment and prevention	1,454	1,295	2,254
Educational—Reference library, &c.	742	525	898
Research and experimental equipment, &c.	4,867	6,387	6,950
Afforestation—Nurseries and plantations	194,556	248,404	159,128
Sand-dune reclamation	480	1,689	1,263
Land-purchase	6,361	12,958	23,211
Miscellaneous	98	1,446	5,943
Totals	393,065	427,418	325,170

Although interest and loan expenses have increased by some £23,000, the net expenditure for the year shows a decrease of £34,353 on that of the previous year. This was chiefly due to a reduction in the planting programme and the fact that during the summer of 1929–30 thinning and underscrubbing in the older plantations was undertaken on a fairly extensive scale.

4. State Afforestation.

TABLE 3.

Summary of Operations in Plantations to 31st March, 1931.

Plantation.	Year of Establishment.	New Area planted.	New Area Direct sown.	Total Area.
		Acres.	Acres.	Acres.
Riverhead	1926	1,647	..	10,525
Maramarua	1928	6,058	..	11,827
Puhipuhi	1904	..	..	783
Tairua	1930	1,882	..	1,882
Whakarewarewa	1898	..	..	7,591
Waiotapu	1901	..	..	7,079
Kaingaroa	1913	29,212	15	176,016
Karioi	1927	2,131	..	11,757
Erua	1930	291	..	291
Golden Downs	1927	4,101	80	9,657
Westland	1922	..	..	1,490
Hanmer	1901	185	..	7,735
Balmoral	1916	1,946	..	20,509
Eyrewell	1928	3,733	..	15,741
Blue Mountains	1925	..	..	8,713
Greenvale	1917	..	..	3,715
Dusky Hill	1893	..	..	751
Conical Hills	1903	..	..	3,551
Naseby	1900	772	..	3,352
Pukerau	1915	..	..	565
Pebbly Hills	1930	1,778	..	1,778
Minor areas	..	16	..	1,695
Totals	..	53,752	95	307,003*

* Does not include 273 acres of direct formation not deemed to be established.

To the grand total of 53,752 acres of new plantations (excluding 95 acres of direct formation) the largest individual contribution was from Rotorua Region, with a further area of 29,212 acres of pumice country afforested on Kaingaroa Plains, the next in order of acreage being Auckland Region.

It is interesting to note that the area of State plantations in the North Island now approximates 228,000 acres, as against 79,000 acres in the South.

The only new project was Tairua (referred to in last year's report), where the initial season's planting resulted in the establishment of 1,882 acres.

Plantation Cleaning and Thinning, &c.

No thinning was done in Rotorua Region during the past season, but a total area of 872 acres was cleaned: Waiotapu Plantation, 197 acres; Kaingaroa Plantation, 675 acres.

At Hanmer Plantation 2,700 acres were underscrubbed, and during the process many weed trees were removed. Thinning was done in the older-age classes over an area totalling 1,388 acres. A further area of 160 acres of *Pinus ponderosa* and *P. Laricio* was thinned to a 16 ft. spacing for special seed-production.

At Balmoral Plantation 569 acres were underscrubbed, and 151 acres at Raincliff Plantation were similarly dealt with. At Conical Hills thinning was continued, and 1,143 acres were treated before the season closed. Further underscrubbing was carried out as follows: Greenvale, 21 acres; Pukerau, 18 acres; Naseby, 71 acres.

It has been noticed that snow has been responsible for breaking down many trees in the shady gullies of Dusky, Conical Hills, and Pukerau Plantations, and unless further thinning can be carried out at these stations without delay more serious losses are almost certain to occur.

Local Collection of Tree-seed.

The Service endeavours to collect locally as great a proportion of its seed-requirements as possible, purchasing overseas supplies only where these are not obtainable within New Zealand. During the past year this activity was well maintained, and a total of 4,533 lb. of locally collected seed was sown in the various nurseries.

Experience has proved that a well-controlled seed-collecting organization can produce seed within New Zealand at a lower price than that paid for imported supplies, while from the point of view of

nursery production of trees most species of locally collected seed have proved to be definitely superior. Every care is taken to ensure that seed is collected only from the best types of thrifty and disease-free trees, such careful selection of parent trees being impossible in the case of supplies collected overseas.

Most regions now possess facilities for the economical collection and extraction of tree-seed, and this important by-product of the older plantations can therefore be utilized to the fullest extent, thus reducing an establishment cost and providing employment in its collection.

Sale of Trees and Seeds.

As intimated in last year's report, it was decided to discontinue the sale of trees from State nurseries for private planting. This took effect as from the end of the 1930 planting-season, and, naturally, the year's sales showed a marked falling-off when compared with the returns for the past few years. Nevertheless, although sales were practically confined to big lots to Government Departments, local bodies, afforestation companies, &c., a total number of 1,211,660 trees were disposed of, for the sum of £4,488. The largest single order was from Australia, for 100,000 trees. The sale of tree-seeds likewise showed a decline, and totalled 851 lb., including 526 lb. sold to Australia.

In accordance with the practice of former years, small packets of seeds were distributed gratis to schools, and 170 lb. were used in this way—94 lb. to schools in the North Island, and 76 lb. to those in the South.

5. Private Afforestation.

Tree-planting by afforestation companies, local bodies, &c., was continued, and it is reported that the total area of exotic plantations established by these bodies is now approximately 221,000 acres—an increase of 41,000 acres over last year's area. Of this total, private afforestation companies are responsible for the establishment of 200,000 acres.

6. Timber Industry.

General.

For the year ended 31st March, 1930, the production of timber showed an increase of 4½ per cent. over the output for the two previous years, but the indications are that there will be a decline in the figures for the year just ended, and although final figures cannot be given, as returns are incomplete, it is expected that the reduction will be approximately 30 per cent.

There is a total of 420 mills in the Dominion, including some forty-six operating in exotic plantations; but at the present time the demand for timber has decreased to such an extent that only 78 mills are working full time, 178 are working only part time, and 164 are closed. The falling-off in demand in both domestic and export trade is world-wide, and the current sales of standing timber are, of course, affected in direct ratio. During the depressed state of the timber-market the practice of the Service has been, and is, to withhold from sale all timber except what is absolutely necessary to meet the requirements of existing operators, and to offer no timber for disposal unless it has been definitely applied for. The result of this policy is reflected in the year's timber-sales, particulars of which are as follows:—

Timber-sales.

The sales for the year were fifty-six in number, covering a total quantity of 42,118,024 board feet, with a value of £41,883, as compared with a number of fifty-eight, a quantity of 60,053,000 board feet, and a value of £73,865, for the previous year. This represents a fall of 17,934,976 board feet, or 30 per cent. in quantity, and £31,982, or 43 per cent., less in selling-price. Of this reduction in price, 13 per cent. represents lower values.

The commitments made by the purchasers of standing timber have been waived in cases where hardship is evident, and reasonable postponements of payments have been allowed, free of interest, to help millers overcome their difficulties. These financial concessions are, of course, reflected in decreased revenue receipts as detailed elsewhere in this report.

7. Fires and Fire Districts.

After several years of comparative immunity from serious forest fires, Auckland Region suffered severely from four fires, three of which occurred in the State forests of the far North, and the other in southern Auckland. In all, over 3,000 acres of cut-over bush, scrub, and fern lands were burned, and 57,000 ft. of totara, miro, and rimu were scorched. Three of these fires occurred through sparks from adjoining settlers' fires, but there is good reason to suppose that the fourth was lighted deliberately, although, despite the fullest inquiries, the offender has not been traced. Rotorua Region reports three fires, none of which did any serious damage. A similar position obtained in Wellington Region, where five small fires were recorded, one of which damaged standing bush to the value of £20. Seven fires were detected in Nelson Region, where 2,330 acres of cut-over bush and fern-scrub lands and 4 acres of one-year-old *Pinus Laricio* trees (Golden Downs Plantation) were burned. The only fire in Westland Region was one which originated close to the plantation, and by spreading quickly it destroyed 15 acres of young trees before it could be checked. Although Canterbury Region experienced the driest summer for many years past, no fires damaged State forests or plantations. On the other hand, however, many local body and privately-owned plantations suffered more or less severely; in one instance 150 acres of plantation, valued at £2,500, was destroyed. In Southland Region the fire hazard was low, owing to a wet summer, and no fires endangered either the indigenous or exotic forest.

Fire Districts.

Since last report the boundaries of two existing fire districts were extended, and two new private districts were constituted. This brings the grand total to forty-one (of which eight are private districts), and the area covered now exceeds 2,250,000 acres.

8. Wild Life in State Forests.

General.

To the limit of the funds available, the Service continued its campaign against those herbivorous animals in State forests which destroy forest-growth, and was responsible for the destruction of 27,260 wild pigs, 28,474 rabbits and hares, 6,880 deer, 386 goats, 951 bush-rats, 49 wild horses, and 32 wild cattle—a grand total of 64,032. Of the deer destroyed, 5,747 were shot in the indigenous forests and 1,133 in exotic plantations. For deer destroyed by private hunters in the South Island a State bonus of 2s. per tail was paid through the Department of Internal Affairs. Forest Officers counted and destroyed 12,267 tails under this heading. No payment, of course, was made in regard to the 6,880 deer first mentioned.

Utilization of Hides, &c.

As emphasized in previous reports, it is apparent that the ultimate solution of wild-life control lies in developing the economic exploitation of the animals' hides, &c., as the cost of equipping and maintaining organized shooting-parties in the field over long periods is too great to justify the results obtained, and poisoning has proved ineffective after many and varied methods were tried. For a time the prospects of a payable overseas trade in hides and venison seemed bright, until the general fall in prices affected the world's markets so seriously as to make the exploitation of these commodities quite unprofitable.

The Service has continued its efforts to seek out new uses for the hides of deer, pigs, and goats, and has succeeded in inducing certain local tanning firms to accept small regular consignments of deer and goat hides for leather-making. The High Commissioner's Office in London is continuing its investigations into the commercial utilization of wild-pig and deer hides.

Wild-pig Menace.

Wild pigs are still very numerous in parts of Taranaki, and are increasing in the bush country in the Bay of Plenty and in Nelson. A bonus of 1s. per snout was paid on the wild pigs destroyed, and the sum spent was £1,371, as against £1,327 for the preceding year.

Opossums.

Permits issued to take opossums in State forests numbered 548. The total catch for the year was 101,541, of which 36,623 were taken in State forests. Unfortunately, prices dropped 75 per cent. as compared with the previous year, and good superfine skins realized only from 5s. to 7s. 6d. each.

CHAPTER II.—RESEARCH AND EXPERIMENTS.

1. Forest Biological Research.

In connection with the scheme for the establishment of the Forest Biological Research Station to deal with insect and fungal diseases of trees and timbers, under the direction of Dr. D. Miller, researches of considerable importance have been carried out during the year, especially in the case of insect pests, the mycological branch having been established only toward the close of last year. This station is the outcome of co-operation between the State Forest Service, Department of Scientific and Industrial Research, Department of Agriculture, Timber-growers' Association, and Cawthron Institute.

The entomological researches dealt with the completion of the survey of the insect conditions throughout the exotic-tree areas of the Dominion, and with such specific pests as the European bark-beetle (*Hylastes ater*), the spruce-aphis (*Neomyzaphis abietina*), the steel-blue horntail (*Sirex juvencus*), tortrix moths, and eucalyptus pests. The major researches were confined to the European bark-beetle, spruce-aphis, and the parasitic control of the horntail. Experimental establishment was undertaken of two additional parasites for the control of the gum-tree scale (*Eriococcus coriaceus*); while it can now be definitely stated that the parasite (*Anaphoidea nitens*) imported from Australia for the control of the gum-tree weevil (*Gonipterus scutellatus*) is well established and has the weevil under control at several points.

At the mycological section of the station commencement was made, through the co-operation of the Plant Research Station of the Department of Agriculture, for the training of an assistant for the purpose of undertaking a survey of the forest diseases under field conditions, and a study of nursery methods in relation to origin of forest disease. Special researches will be taken up as this section develops, promising and profitable lines of study appearing to lie in the direction of (*a*) nursery infections, and (*b*) of mycorrhizal relationships of tree crops.

2. Forest Ecology.

Plant-animal Problems.

The year just past has been marked by a distinct advance in the study, and to a certain extent in the solution, of the numerous ecological problems confronting the Service. Up to the present, in dealing with ecology, it has been the habit to treat merely of the combinations of plants which form portions of the forest. A moment's thought will show that this view of ecology—for forestry purposes, at any rate—is far too limited, and that, in addition to the plants, the animals associated therewith must be considered, especially those browsing and grazing animals of large size which now abound in nearly all forests from the East Cape to Stewart Island. Viewed in connection with this statement, the outstanding feature of the past year's work has been the destruction of some 64,000 animals in State forests. These include wild cattle, wild horses, deer, chamois, wild pigs, goats, rabbits, hares, and rats, as mentioned elsewhere in this report. When it is considered that this figure excludes the activities of other Departments of State, excludes all private efforts, and is the result, in the main, of a six months' campaign only, it can surely no longer be denied that our forest population of alien forest-destroyers is so large as to exert a most profound ecological influence on the vegetation of the country, and that this influence must be, in all its aspects, detrimental to the realization of the maximum forest production. The fact that action on such a large scale has been made possible has afforded much gratification; but the point cannot be too strongly made that the campaign has just begun, and that any slackening of effort will lose the ground already won. This campaign has been the only step taken to apply generally and on a large scale the results of ecological investigations.

Indigenous-forest Problems.

In other directions, however, investigations have gone forward, and quite noteworthy conclusions have been arrived at. Dr. Cockayne records proofs of the "weed significance," from a silvicultural viewpoint, on certain indigenous ferns. Numerous field studies inaugurated by him have proved that colonies of *Blechnum discolor* and *Dicksonia squarrosa* appear and multiply vegetatively at a rapid rate by means of rhizomes, a fact not before suspected. These colonies undoubtedly prevent all regeneration of native species beneath their shade; and quite independently of Dr. Cockayne's investigations other officers of the Service established plots to find out whether fern-growth could be regulated sufficiently to allow adequate natural regeneration on the forest-floor. Northern plots seek to establish kauri regeneration at Waipoua by control of the tree-fern *Cyathea dealbata;* southern plots aim at controlling *Blechnum discolor* to establish natural stands of silver-beech (*Nothofagus Menziesii*) in Southland.

Still other aspects of the regeneration of the native timber species are being studied at Erua (silver-pine growth plots), and at Rimu in Westland, where the factors controlling regeneration of rimu (*Dacrydium cupressinum*), miro (*Podocarpus ferrugineus*), and silver-pine (*Dacrydium Colensoi*) have been a subject of study by Messrs. Foweraker and Hutchinson for the past six years. The reports of these two members of the staff of Canterbury College School of Forestry have been referred to in many previous reports; but, of necessity, concrete results were not obtainable for the first few years of observation and establishment of plots. This year, however, can record such satisfactory statements as the following: "Silver-pine and rimu seedlings are now protruding above the top of the 4 ft. growth of fern in numbers sufficient to give promise of a fully-stocked pole stand. This same area, searched carefully in 1928, showed no individuals above the fern level." And elsewhere: "Distinct growth (of rimu seedlings) has been made. The maximum is a height of over 2 ft. in an individual seedling three years old." These investigators conclude their report in the following terms: "It is asserted that the results so far secured, vague and indefinite as they may be held in quantitative terms, have left the investigators more firmly convinced each successive season that the rimu forests are fully capable of reproducing and developing under existing site conditions, and may be depended upon to hold their own and to extend their area over cut-over lands *if given adequate fire protection, with perhaps also the exclusion of stock* . . . The results so far secured indicate that true economy would dictate at this juncture a really serious consideration of the value of the native forests as permanently producing assets." This is couched in strong terms, and merits at least a continuance of investigations with such hopeful tendencies.

To sum up the position, it would seem to be now assured that certain native species could be successfully re-established *in selected optimum sites*, the great liability incurred by the very long rotation being probably offset by the cheapness of natural establishment and consequent low interest charges, along with the ultimate greater value of the product.

In order to carry these as yet almost academic conclusions to the next logical stage of small-scale trial in the field, work is, as already mentioned, proceeding at Waipoua Silvicultural Research Station (for kauri); at Rimu, in Westland (for rimu); and at Wairio, in Southland (for silver-beech).

Mixed Indigenous-Exotic Problems.

A totally different series of problems is presented by the possibility of improving cut-over or degenerate native-forest areas by the use of shade-bearing exotic conifers, with the ultimate aim of producing a mixed crop of exotic conifers with indigenous second growth.

To this end have been established the Erua Experimental Area in the North Island, and certain compartments of Golden Downs Plantation in Nelson. The former is a cut-over podocarp area, underplanted, after differing treatments of the residual stand, with both pines and cypresses of various species. Good results so far have been achieved with both Douglas fir and Lawson's cypress, whilst lodgepole pine is also promising. The latter is an area of very poor and deteriorated upland beech forest marching with the Golden Downs Plantation boundaries. Dead and moribund veteran beech-trees have been felled, and in the gaps so caused Douglas fir and various cypresses have been planted. The experiment is yet young, but all species chosen are promising well, and if deer can be excluded as successfully as they have been for the past three years it is almost certain that an unremunerative native hardwood stand badly understocked will be cheaply converted into a good exotic-softwood stand quite fully stocked.

Exotic-forest Problems.

With respect to the planting of exotic forests, the aspect of site in relation to timber-production is being investigated along with the collection of empirical data regarding the most suitable silvicultural treatment necessary to obtain maximum crops.

The early planted stands of exotics have now reached the stage when they can indicate the comparative values for timber-growing uses of varying sites, and at the same time the necessity for definite silvicultural treatment in order to maintain growth-increment on an ascending curve. The sample plots established within the last decade are not as yet of sufficient age to prescribe decisively the optimum methods for treatment, but measurements of volume growth of plots carried out during the year in three regions give support to the recent large-scale thinning operations in all species, and demonstrate in quantitative terms that delay in treatment is being accompanied in the majority of crops by a loss in increment which will ultimately prolong the period before financial returns may be expected from these plantations.

Further investigations are being conducted by means of tabulated sample plots which have been established throughout the Dominion. These include permanent growth-study plots, covering eleven species, of crop ages varying from ten to thirty-one years. The plots established prior to 1921 have been twice remeasured, while others have had one remeasurement. Plot methods have been recently revised and standardized, and the available data have been correlated. Further plots cover experiments on crop establishment by direct seeding (five species), site and species trials (fifteen species), methods of plantation-formation, spacing, crop mixtures, and type of stock, stem-pruning for improved timber-production, and plantation-soil investigations.

Closely related to the silvicultural treatment of the exotic crops are the various investigations begun by the entomological and mycological branches as improvement in the hygienic condition of the plantations. The overdue necessity for detailed field-work in these branches of forest pathology is well exemplified by the discovery of a fairly widely spread infestation of *Hylastes ater*, a species of bark-beetle not previously known to occur in New Zealand (discussed in last year's report). The practical effect of this discovery will probably be an enforced modification of current practice in regeneration of cut-over pine stands in districts infested by the beetle.

3. Waipoua Silvicultural Research Station.

The reasons for setting up this station, and the duties of the officer in charge, were briefly outlined in last year's report. Although the station has been in operation for only eight months, much good work has been accomplished. Suitable domestic accommodation for permanent officers and casual labourers was provided, and a workshop and small office with dark-room attached, were erected. A small nursery was established, and three large sample plots laid out to secure information on different modes of forest and soil treatment. The main boundaries of the forest were traversed and flagged to minimize trespass, which has always been flagrant. Portion of one boundary, however, is still in dispute, as the land-titles are obscure. Telephone communication was extended throughout the forest as a measure of fire protection. Photographic and other recording data are being built up, and already 150 photographs have been filed. Next year the forest growing stock will be inventoried more completely, the work of the past eight months having established the fact that there are, roughly, only some 9,000 acres of commercial kauri forest on the area. This has been known qualitatively for many years (*vide* Dr. L. Cockayne's "Botanical Survey of Waipoua Kauri Forest," 1908). The next step is to get the stock in accurate quantitative terms. When this has been achieved the logical procedure will be to determine whether decadent or over-mature trees can be economically removed whilst regenerative measures are being taken to balance removal by new growth increments.

4. Bleeding of *Pinus radiata* and *Pinus pinaster*.

The experiments inaugurated at Riverhead in September, 1929, to investigate the bleeding of *Pinus radiata* and *P. pinaster* were concluded during the year. Both the French and American systems of bleeding were investigated, the former being undoubtedly best suited for use in New Zealand. The bleeding was not carried out for the whole season, but the results secured indicate that at least 8·5 lb. of resin per tree can be secured per annum from the *Pinus radiata* trees investigated, which is in excess of the yield secured from *P. pinaster*, *P. longifolia*, *P. austriaca*, and *P. excelsa* tapped in their native habitats. The yield from *P. pinaster* was not so great, but can still be considered satisfactory. As the present experiments were made on a relatively small scale, definite figures for cost of collection on a commercial scale cannot be given, but, allowing for the various factors involved, it appears that this cost would be much higher in New Zealand than in France and North America, owing to the different class of labour employed and the higher wages paid.

5. Forest-products Investigations.

The establishment of the fundamental physical, mechanical, and chemical properties of the indigenous and exotic timbers, together with the development of the basic principles governing the arts of kiln drying, wood-preservation, and pulping, and their translation into commercial practice, are the major objectives of the Branch of Forest Products. On the major projects, active progress is reported hereunder.

The study of the fundamental physical and mechanical properties of the indigenous species initiated in 1921 has now been extended to cover twenty-four species, and will probably be brought to a conclusion during the year ended 31st March, 1932. The shipments examined during the year ended 31st March, 1931, included rimu from the West Coast, South Island, silver-beech from Southland, kohekohe, tanekaha, and mangeao. Under a similar study of the exotic timbers a shipment of macrocarpa was also examined. Supplementary to these investigations, further progress has been made with the formulation of structural grades, rules, and the establishment of working-stresses for use by architects, builders, engineers, &c.

The most important result of the boxing and crating studies carried out on behalf of the Department of Agriculture was the establishment of the important fact that the numerous complaints received from overseas markets as to the occurrence of sawdust on butter were the direct consequence of using sawn instead of planed timber for butter-box shooks. Butter stored in locally-grown European-larch boxes was also proved to be free of taint after five months' storage, indicating such a promising avenue of utilization for the large quantities of this species grown in the State plantations that experiments with an overseas shipment will be instituted during the year ending 31st March, 1932.

In an effort to meet a greater portion of the local demand for telegraph and power poles, most of which are at present imported, strength and preservation tests of full-sized rimu poles were carried out with considerable success. The coastal type of rimu forest in Westland and Southland yields poles of excellent shape and strength, and with the development of suitable treating methods, which is contingent upon the establishment of an experimental pressure treating plant, it is anticipated that a thriving industry may soon be established. Approximately 100 poles treated by the non-pressure process have now been placed in use, and will be carefully inspected at regular intervals along with the numerous treated fence-post lines installed in previous years. These service test lines have now definitely established the fact that in most localities a butt treatment is insufficient, and that posts, poles, &c., must receive a fairly heavy full-length preservative treatment to give a satisfactory life.

Although kiln drying still figures as the key problem in the wider and more efficient utilization of the native timbers, it was not possible to proceed with the installation of the pilot kiln as previously anticipated. Nevertheless, several operators have been actively interested in the possibilities of the process and suitable designs prepared for their guidance. As indicative of the ever-increasing public appreciation of kiln-dried timber, it is significant that the specifications for the National Museum call for kiln-dried material. Unless this is forthcoming in native timbers, imported timbers will be used. During the year only one series of piles demonstrative of improved air-seasoning practices was installed, but these have yielded valuable data on air drying in the Westland Region, indicating that both the degrade and average time required to reach moisture equilibrium may be substantially reduced by the methods advocated.

In the field of wood technology the outstanding achievement has been the development of a microscopic identification key for the various beech species. Efforts to develop a key, however, based on the gross characters of the wood—that is, its physical appearance to the unaided eye—have not yet proved successful, but studies along various lines are being pursued. An important study was also commenced dealing with the "heart centre" or "core" in the native hardwoods, the work having been concentrated on silver-beech.

The economic pulpwood survey, for which the necessary field-work is complete, has yielded valuable data not only as regards pulpwood, but in respect to log-utilization generally. As indicative of the close cutting practised by New Zealand mills, it may be mentioned that whereas the Pacific Coast mills of North America yield from their slabs, &c., about 50 cubic feet of good pulpwood per 1,000 ft. b.m. of sawn timber, the local mills yield only 9 cubic feet.

The overseas trade extension work was again concentrated on silver-beech and tawa, two trial shipments of the former, amounting to over 1,000 ft. b.m., being shipped to Great Britain for experimental purposes. Owing to numerous difficulties encountered in the development of suitable seasoning methods for tawa, the despatch of trial shipments of this species has been delayed until this year.

A detailed field examination of wooden buildings in the Hawke's Bay earthquake area was made in co-operation with the timber-utilization officer of the New Zealand Federated Sawmillers' Association, and a report prepared and published for use as a basis of recommendation for the Government Building Regulations Committee.

Minor projects in course of progress include silver-beech and tawa for wine-keg experiments, tests of white-pine for wooden match-box skillets, and of silver-beech for rifle-stocks, bleeding of European larch for venetian turpentine, routine wood-identifications, nail-pulling tests, &c.

CHAPTER III.—THE TIMBER TRADE.

1. Markets.

A review in the annual report for the year ended 31st March, 1930, indicated that from a study of the export and domestic markets, including an investigation into the interrelations of the housing ratio and timber-consumption, the industry would be faced with a decreased demand for the period now under review. At no time, however, was it anticipated that the decrease in demand would develop either as soon or as rapidly as has since occurred, and the phenomenal decline in building activities is almost wholly responsible for this position. Until public confidence is restored it is improbable that building activities will return to normal. The most promising feature of the present situation is that, in sympathy with the general price-decline, building-costs are falling appreciably and will probably become stabilized within the very near future, when the general wage question, now in course of consideration, is settled. Having foreseen this development, various institutions, firms, and individuals who have suspended indefinitely their building activities may reasonably be expected to revive them, thereby not only improving the demand for timber, but also recreating employment in numerous allied industries.

A somewhat similar situation exists in regard to houses. With the supply much in excess of the demand in most centres, there has been a general exodus from old-fashioned into more modern homes. Also of some significance is the possibility of modernizing old-fashioned houses.

As in all periods of rapidly falling consumption, foreign timbers have assumed during the year 1930 a more serious effect than usual upon the demand for local timbers. This is due to the invariable delay in their importation, since merchants must contract considerably ahead for their requirements—sometimes as much as a year. Thus the imports during 1930 represent commitments based upon the optimistic note which pervaded building and constructional circles at the end of 1929, before the present depression developed to any serious extent. Already for the first three months of 1931 imports reflect the serious decline in building activities, amounting to only 5 million ft. b.m. as compared with 17 million ft. b.m. imported during the corresponding period of 1930, and it is estimated that the current year's totals will be the lowest since 1923, when only 40 million ft. b.m. were imported as compared with the peak record of 82 million ft. b.m. shipped into New Zealand during 1925. During the current year, therefore, it is confidently asserted that the exchange position, together with price-readjustments, will combine to enable the local timbers to compete more effectively with the imported woods than at any other time during the post-war period.

As to the Australian export markets, practically the whole of the contraction in demand was accounted for by white-pine, the carry-over from the heavy exports in 1929, combined with the general depression during 1930, resulting in purchases being strictly limited to immediate essential requirements. At the conclusion of the current dairying season, however, it is estimated that stocks will have been liquidated, if they have not already been done so, to a point where ordering for next season's requirements is necessary, and an early improvement is anticipated. Rimu exports, amounting to 3½ million ft. b.m., actually displayed a slight improvement as compared with the previous year, a trend which may reasonably be expected to continue, since under the existing tariff and with a return to normality there is a potential market in the Commonwealth for 20 million ft. b.m. of this species per annum.

2. Industrial Technique.

Although logging ranks as the most efficient branch of the industry, and better logging and yarding methods and equipment are constantly being developed, the fact remains that there still exists room for improvement. Considerable interest has been shown in overhead logging systems, and several installations have been successfully operated; but little attention has yet been directed to the possibilities of tractor logging. Diesel logging and yarding engines also merit further examination.

In their yards operators continue to pay increased attention to the improvement of stacking or piling methods, but there is still a tendency to keep the bottoms of piles too close to the ground, and to fail to appreciate the importance of adequate drainage and good sanitation. Stickers and waste timber infested with insects and decay are characteristic of far too many yards. No new dry kilns have been installed during the period under review, but there is a rapidly increasing appreciation of their possibilities, and several units, it is anticipated, will be erected during the next year. Some operators continue to attempt artificial drying with inefficient equipment—so much so that it was found necessary to broadcast a public warning that unless dried in kilns of approved and recognized design and operation kiln-dried timber could not be regarded as satisfactory.

3. Statistics.

The following tables, showing production, imports, and exports, are presented in substantially the same form as in previous years, but the use of footnotes is extended to replace the usual text.

TABLE 4.

Reported Production of Rough-sawn Timber.

(From information supplied by the Government Statistician. All figures refer to the years ended 31st March.)

Species.	1928.		1929.		1930.	
	Quantity.	Per Cent.	Quantity.	Per Cent.	Quantity.	Per Cent.
	Ft. b.m.		Ft. b.m.		Ft. b.m.	
Rimu	156,314,000	58·0	156,240,000	57·9	163,293,000	57·8
White-pine ..	53,736,000	19·9	56,790,000	21·0	58,505,000	20·7
Matai	15,207,000	5·6	15,753,000	5·8	17,972,000	6·4
Kauri	15,874,000	5·9	10,743,000	4·0	10,471,000	3·7
Totara	10,728,000	4·0	8,611,000	3·2	9,046,000	3·2
Beech	7,923,000	2·9	9,846,000	3·6	10,225,000(1)	3·6
Insignis pine ..	7,695,000	2·9	9,168,000	3·4	10,382,000(2)	3·7
Other	2,306,000	0·8	3,063,000	1·1	2,511,000	0·9
Totals ..	269,783,000	100·0	270,214,000	100·0	282,405,000(3)	100·0
Average, f.o.r. Mill value	18s. per 100 ft. b.m.		17s. 9d. per 100 ft. b.m.		17s. 11d. per 100 ft. b.m.	

(1) A peak record.
(2) Only once exceeded, in 1922, when 11 million ft. b.m. were sawn.
(3) Production by regions: Auckland and Rotorua, 98 million ft. b.m. (35 per cent.); Wellington, 57 million ft. b.m. (20 per cent.); Westland, 72 million ft. b.m. (26 per cent.); Southland, 30 million ft. b.m. (10 per cent.); Nelson-Marlborough, 14 million ft. b.m. (5 per cent.); and Canterbury-Otago, 11 million ft. b.m. (4 per cent.).

TABLE 5.

EXPORTS OF SAWN TIMBER[1] AND OTHER FOREST PRODUCE.

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1929–30.)

Item.	1929.			1930.		
	Quantity.	Value.		Quantity.	Value.	
		Total.	Per 100 ft. b.m.		Total.	Per 100 ft. b.m.
	Ft. b.m.	£	s. d.	Ft. b.m.	£	s. d.
White-pine[2]	30,493,000	317,990	20 10	19,187,000	206,030	21 6
Rimu[3]	3,122,000	27,140	17 4	3,501,000	30,690	17 7
Beech[4]	3,016,000	39,700	26 4	1,974,000	26,070	26 5
Kauri[5]	2,123,000	51,040	48 0	1,088,000	27,950	51 4
Other[6]—						
New Zealand	349,000	3,470	19 11	926,000	9,850	21 3
Foreign	51,000	610	23 0	21,000	210	20 0
Totals	39,154,000	439,950	22 6	26,697,000[7]	300,800	22 6
	Tons.	£	Per Ton. £ s. d.	Tons.	£	Per Ton. £ s. d.
Kauri-gum	4,937	267,610	54 5 0	3,818	189,640	49 12 0
Tanning-bark	53	900	16 19 7	99	1,250	12 12 5
Fungus	76	9,200	12 0 0	90	11,400	126 13 7

(1) 97 per cent. exported to Australia; remainder to Pacific islands and United Kingdom.
(2) Exported for butter-boxes, shelving, whitewood furniture, &c.
(3) For flooring and linings.
(4) For motor-bodies, agricultural implements, and wood-turnery.
(5) For flooring, linings, tanks, vats, &c.
(6) Includes matai for flooring and linings for Australia, and insignis pine for fruit-cases for Pacific islands.
(7) Decrease due largely to heavy imports of white-pine by Australia during the previous year. As stocks are being rapidly liquidated, an improvement in demand for white-pine is anticipated.

TABLE 6.

IMPORTS OF SAWN TIMBER AND OTHER FOREST PRODUCE.

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1929–30. Value represents value in country of export, plus 10 per cent.).

Item.	1929.			1930.		
	Quantity.	Value.		Quantity.	Value.	
		Total.	Per 100 ft. b.m.		Total.	Per 100 ft. b.m.
Hardwoods—	Ft. b.m.	£	s. d.	Ft. b.m.	£	s. d.
Australian hardwoods	22,116,000	334,450	30 2	33,943,000[1]	501,910	29 7
Oak	2,514,000	66,670	53 2	2,329,000	62,990	54 0
Ash, hickory, &c.	161,000	6,700	83 2	169,000	7,150	84 7
Total hardwoods	24,791,000	407,820	32 11	36,441,000	572,050	31 5
Softwoods—						
Douglas fir	16,188,000	113,840	14 1	12,807,000[2]	87,760	13 9
Redwood	11,678,000	130,310	22 4	9,345,000[2]	100,910	21 7
Hemlock and spruce[3]	4,108,000	39,580	19 3	6,142,000[3]	51,010	16 7
Butter-boxes	3,147,000	42,530	27 0	4,691,000[4]	63,620	27 2
Cheese-crates[5]	1,373,000	15,210	22 2	1,774,000[5]	18,240	20 7
Cedar	1,335,000	13,530	20 3	637,000[2]	7,210	22 8
Total softwoods	37,829,000	355,000	18 9	35,396,000	328,750	18 7
Other	210,000	7,140	68 0	257,000	6,170	48 0
Grand totals	62,830,000	769,960	24 6	72,094,000	906,970	25 2
	Number.	£	Per 1,000.	Number.	£	Per 1,000.
Laths, palings, shingles, &c.	14,215,000	20,230	28 6	7,777,000	10,540	27 1
	Tons.	£	Per ton. £ s. d.	Tons.	£	Per ton. £ s. d.
Tanning-bark	1,918	23,210	12 2 0	2,531	30,080	11 17 9
Wood-pulp	4,327	50,650	11 14 0	3,762	40,520	10 15 2

(1) Large increase owing to imports of poles and sleepers. Although the use of local timbers for these purposes has been increasing slightly during recent years, generally speaking the supply is limited.
(2) Decline is in sympathy with decreased building activities.
(3) Mostly hemlock fruit-cases for the fruit export trade.
(4) Mostly Scandinavian spruce. Although condemned by both the Department of Agriculture and the Dairy Control Board, its use has increased, although believed to be only temporary.
(5) Mostly Pacific Coast hemlock.

CHAPTER IV.—GENERAL.

1. Forest Reconnaissance, Demarcation and Surveys.

Indigenous Forests.

Forest Reconnaissance.—In obtaining data for the forest inventory, forest reconnaissance surveys were made at convenient intervals when the more urgent works of tree-planting and timber cruising were complete. This work involved cutting parallel lines at 40-chain intervals, from which physical features were fixed and standing trees measured. The area surveyed was 124,700 acres, on which it is estimated there is 367,318,000 ft. (b.m.) of timber.

Demarcation.—Forest reconnaissance, the survey of opossum-trapping blocks, and operations at Waipoua Silvicultural Research Station involved the cutting and surveying of 7,000 chains of forest boundary-lines.

Opossum Blocks.—An area of 29,000 acres of State forest in the vicinity of Mount Holdsworth (Wellington Region) was divided into twenty-nine opossum-trapping blocks.

Timber Cruising.—In State forests a total area of 5,016 acres was cruised, carrying approximately 35,400,000 ft. (b.m.) of milling-timber.

On 553 acres of land held privately and by other State Departments 2,900,000 super. ft. b.m. of milling-timber were measured. The cruise plans show general physical features and contour-lines.

Tramway Traverses.—Traverses of 1,100 chains of bush tramway were fixed by chain and prismatic compass.

Afforestation Areas.

Topographical and Layout Surveys.—The fixing of 50 ft. contours and physical features of land principally covered in manuka comprised an area of 107,600 acres. Of this area, 69,600 acres were subdivided into plantation compartments of approximately 300 acres, surrounded by firebreaks.

Road-construction.—Plantation-roads aggregating 125 miles in length were located and constructed, at an average cost of £32 10s. per mile.

Acquisition and Exchange Surveys.—Survey plans of twelve small areas comprising 1,000 acres were deposited and approved by the Lands and Survey Department.

Species Surveys.—A total area of 53,835 acres was planted during 1930. The location of the species was plotted on copies of the layout survey plans, and where compartments contained more than one species additional magnetic surveys were required.

2. Forest Atlas.

During the year eighty-two general plans and six atlas maps were completed and recorded. The atlas maps cover an area of 58,700 acres, making a total to date of 1,118,853 acres of State forests and plantations so covered, or 14·4 per cent. of the area under control. Topographical plans were prepared for portions of Maramarua, Tairua, and Kaingaroa Plantations, and plans of the layout of firebreaks, planting-blocks, and compartments for portions of Riverhead, Maramarua, Tairua, Kaingaroa, Golden Downs, Balmoral, and Eyrewell Plantations, while species plans of the areas subsequently planted are in course of preparation. New tracings, graphs, &c., totalled 1,124, in addition to 685 white prints and 119 photostat prints. Maps comprised seven atlas sheets and one of opossum-trapping blocks.

3. Photographic Records.

A further 2,006 negatives were recorded, while 8,123 prints, 303 lantern slides, and nine enlargements were made.

4. Publications.

2,000 copies Circular No. 30: "Medium-class Rimu."
1,000 copies Circular No. 31: "Trees used in State Afforestation in New Zealand."
1,000 copies Leaflet No. 16: "The Properties and Uses of Kahikatea."

5. Reference Library.

Over the past ten years the Service has built up a library containing over 6,000 volumes, pamphlets, &c., which is a complete source of reference on all matters pertaining to theoretical and practical forestry and its many cognate subjects, and which enables officers to keep abreast of modern forestry practice in other countries. An excellent and valuable system of reciprocal exchange of periodicals, leaflets, annual reports, &c., is maintained with forestry organizations in all civilized countries.

6. Unemployment Relief.

As has been customary in previous years, an extended planting programme was undertaken with a view to engaging as many unemployed seasonal workers as possible. For the season under review approximately 2,000 men were given employment for periods ranging from a few weeks to five months. During the period May to October the monthly average of relief workers was 700, in addition to a permanent labour complement of 400 men. The maximum number of men employed at any one time was 1,360. Upon the termination of the planting-season certain other works, such as plantation-thinning, underscrubbing, land-clearing, &c., were put in hand to alleviate unemployment. Regional reports indicate that, generally speaking, satisfactory results were obtained.

7. Honorary Forest Rangers.

The valuable co-operation received from the honorary Forest Ranger staff in patrolling and protecting so many of our State forests has again been of material assistance to the Department. New appointments made during the year, less retirements, have brought the total number of honorary Rangers to 127.

APPENDIX.

SUMMARIZED REPORTS OF STATE AFFORESTATION.

Auckland Region.

Nurseries.—Two nursery areas have been established in connection with Tairua Plantation, and generally good growth is reported, although the dry summer weather was responsible for heavy mortality amongst certain species of the lined-out seedlings. The results from the 1930 sowing varied considerably. *Cupressus Lawsoniana* and *Thuya plicata* recorded a survival of 98 and 90 per cent. respectively, but *Pinus pinaster* and *P. canariensis* failed almost completely. Good percentages of survival were also obtained from *Pseudotsuga Douglasii*, *Sequoia sempervirens*, and *Pinus radiata*.

Plantations.—The major afforestation operations in this Region are now confined to the Tairua project, where 1,882 acres were planted last season. The older plantations—Riverhead, Puhipuhi, and Maramarua—are practically on a maintenance basis, with the exception of some minor areas which still remain to be planted and some necessary blanking.

Rotorua Region.

Nurseries.—Seed-sowing conditions at Wairapukao (Kaingaroa Plains) were somewhat trying, as heavy winds uncovered 12 acres of sown beds and rendered necessary the resowing of 3½ acres; but the nursery at Rotorua did not suffer to the same extent, and the results obtained there were very satisfactory. At the two nurseries a total quantity of 6,654 lb. of seed was sown, which produced a combined crop of approximately 30¼ million trees. The stock available for 1931–32 planting is estimated at 13,700,000 trees, and an estimated crop of 23,000,000 seedlings will be carried over to the 1932–33 planting season.

Plantations.—The area of new plantations aggregated 29,212 acres planted on the notch system, with an average of 668 trees per acre—insignis pine (*P. radiata*), Corsican pine (*P. Laricio*), Douglas fir (*Pseudotsuga Douglasii*), redwood (*Sequoia sempervirens*), and western yellow-pine (*P. ponderosa*), in that order, being the principal species used.

Tree and Seed Sales.—Trees sold to Government Departments, local bodies, afforestation companies, farmers, &c., numbered 914,290. The revenue from this source was £3,396, while a total sum of £274 was received from the sale of 252 lb. of seed.

Wellington Region.

Nurseries.—Seed-sowing was carried out during the months of October and November, 724¾ lb. of seed being used. A good strike resulted, and the number of trees raised approximated 4,285,000. In addition to this seedling stock, a further 2,900,000 two- and three-year-old trees are available for future use. The establishment of a nursery at Putorino to supply stock for an afforestation project in Hawke's Bay was taken in hand during September, 1930, and despite adverse climatic conditions good progress was made until March, 1931, when for reasons of economy further work was discontinued.

Plantations.—The new area planted at Karioi comprised 2,131 acres, with 1,426,000 trees, the species used being principally *Pinus murrayana*, with lesser numbers of *P. Laricio* and *P. ponderosa*. It was found necessary to blank 2,980 acres of the 1928 and 1929 seasons' planting, and this was done with *P. radiata*.

Nelson Region.

Nurseries.—At Golden Downs nurseries seed-sowing was commenced in October and completed two months later. From a total sowing of 1,771 lb. of seed an estimated crop of 13,400,000 seedlings was raised, comprising principally Douglas fir, Corsican pine, and insignis pine. The trees carried forward from the previous year totalled 2,422,000, from which 1,662,000 were transferred to the plantation.

Plantations.—A further area of 4,101 acres was planted at Golden Downs, and a good strike resulted, although the planting-season was unusually dry. The principal species used were *Pinus radiata* (1,742 acres), *Cupressus Lawsoniana* (846 acres), *Sequoia sempervirens* (572 acres), *Pinus Laricio* (307 acres), and *Pseudotsuga Douglasii* (297 acres).

Westland Region.

Westland Plantation.—This project has been dealt with in previous reports as an experimental area, but it has now passed beyond that stage, and will for the future be treated as a plantation. No new area was planted during the year, but the usual maintenance-work, clearing of firebreaks, drainage, and fire-control measures were carried out.

Canterbury Region.

Nurseries.—At Balmoral 2,555 lb. of seed were sown, and the present stock of trees is estimated at 12,000,000. At Eyrewell 442 lb. of seed were sown in lines, and a crop of 3,000,000 trees will be available for use in the coming year. The 1929 sowing of 100 lb. of seed produced 545,000 plants.

Plantations.—Planting was almost wholly confined to Eyrewell and Balmoral Stations, where new areas of 3,733 and 1,946 acres respectively were established. In addition, a total area of 9,124 acres was reconditioned with 4,070,000 trees.

Southland Region.

Nurseries.—Abnormal weather conditions prevailed during the greater part of the year at Tapanui Nursery—a severe winter, followed by heavy rainfall, with little sunshine—and although seed-sowing was started in October it was not completed until late in December. 875 lb. of seed were sown, which resulted in a crop of 2,970,000 trees. The total stock of trees at the close of the year was 4,213,000. Naseby Nursery was closed at the end of the planting-season.

Plantations.—The main afforestation work was done at Pebbly Hills, where 1,778 acres were planted. The planting of 772 acres at Naseby completed the work at this station, and the plantation will henceforth be on a maintenance basis.

Approximate Cost of Paper.—Preparation, not given; printing (1,950 copies), £22 10s.

By Authority: W. A. G. Skinner, Government Printer, Wellington.—1931.

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