1928.

NEW ZEALAND.

STATE FOREST SERVICE.

THE ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1928.

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 August, 1928.

I have the honour to submit herewith the annual report of all operations of the State Forest Service for the year ended 31st March, 1928, as required by section 64 of the Forests Act, 1921–22.

In doing so, however, I desire to inform you that the highly satisfactory results herein recorded were obtained whilst the Service was under the control of the late Director of Forestry (Mr. L. MacIntosh Ellis), who resigned his position as from the last-mentioned date and is now resident in Australia.

I have, &c.,

E. PHILLIPS TURNER,

Director of Forestry.

CONTENTS.

REPORT.

CHAPTER I.—GENERAL REVIEW.

Forestry Progress for the Year ended 31st March, 1928.

General.

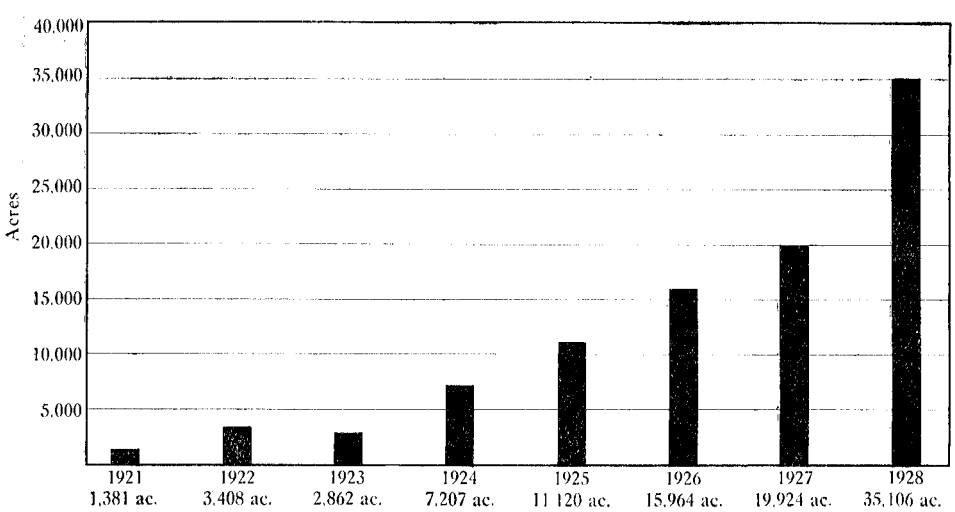
A general review of the year's work shows a remarkable increase in the area planted, approximately 35,000 acres of new plantations having been created, which constitutes a record in this respect and brings the total area of State-owned exotic forest plantations to 133,997 acres, exclusive of areas forested by direct-formation methods which for the year aggregated 2,600 acres.

In other respects progress has been well maintained, although sales of trees and seeds were not so extensive as during the previous year, nor did the total revenue receipts equal the 1926-27 figures.

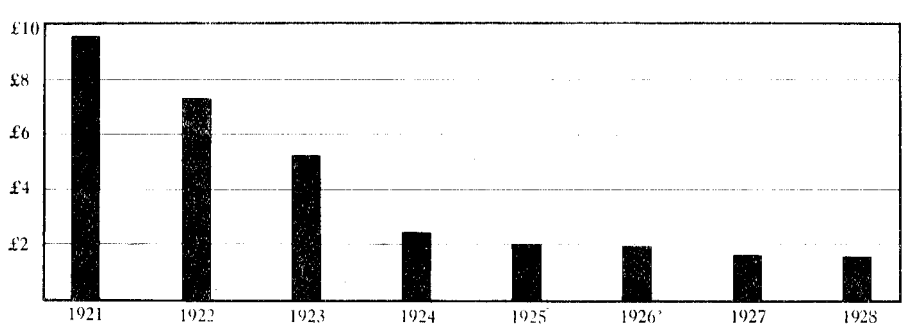
State Afforestation.

In pursuance of the policy enunciated in previous reports, further substantial areas of poor-quality lands in Rotorua, Nelson, and Canterbury-Otago regions were acquired for afforestation, and planting was commenced at Golden Downs plantations—the initial State-afforestation project in Nelson Provincial District. The afforesting of third-class and deteriorated lands which have been found useless for settlement is a forward step, as by this means the waste lands of the Dominion, which at present constitute a breeding-place for noxious weeds and vermin, can be changed from a State liability to a valuable revenue-producing asset.

It is hoped in time, by establishing local plantations, to secure for each province in the Dominion its own self-contained timber-supply.

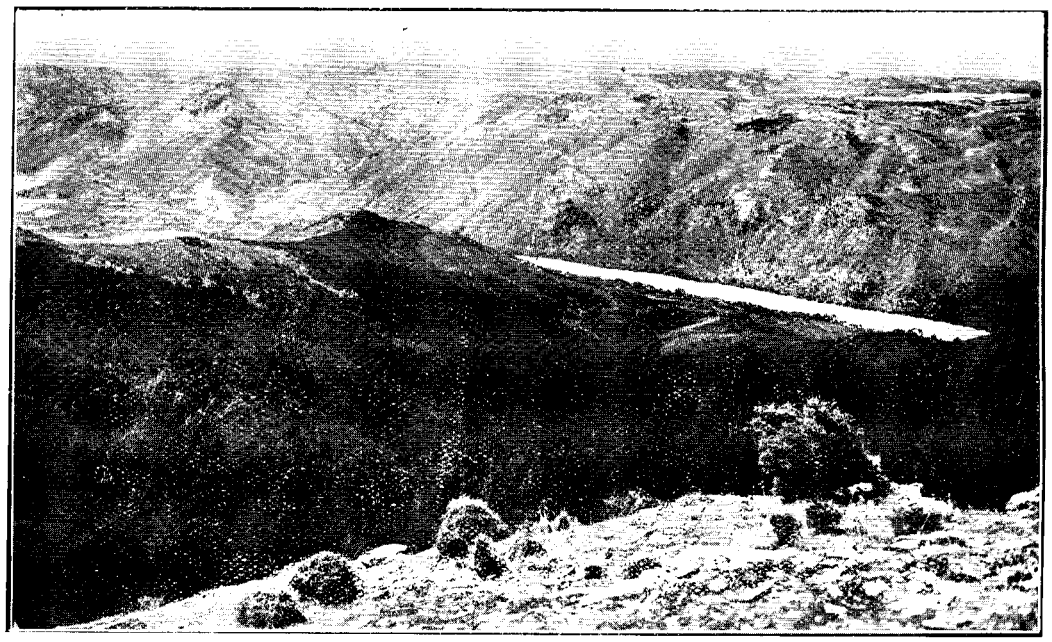


Comparison of Annual Tree-planting Operations in State Forest Plantations for Years 1921-28.



Graph Illustrating the Cost of Establishing One Acre of State Forest Plantations for the Years 1921–28.

(Includes Trees, Surveys, Planting, &c., but not permanent improvements, *i.e.*, Buildings, Fencing, &c.)



Typical View of the Country being planted at Blue Mountains Plantation, Otago.

Successive Timber Crops play an Important Part in Scientific Afforestation.
Larch (twenty-eight years) under-planted with *Cryptomeria japonica* (eight years).

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Wider use of our Indigenous Forests.

The maximum utilization of our indigenous forests can be attained only after intensive forest-products research. The main objects of the latter have been popularly quoted as the means whereby forest waste can be satisfactorily utilized. Waste-utilization is certainly of great importance, but research directed more to enhance the quality of the forest products, thus also increasing their value and indirectly reducing waste, is of still greater value. This latter problem can be accomplished in a number of ways, among which may be mentioned controlling the properties of the material grown through manipulation of the growth process, sorting the material to segregate the properties required in each use, and modifying the properties where sorting is not sufficient.

The State Forest Service has been engaged on these problems for the past seven years, and definite achievements have been made in forest-products researches and their application in industry and use. Results for the year are recorded under the following headings :—

Timber Mechanics.—Determination of the mechanical and physical properties of four species of timber. Green tests conducted on redwood (*Sequoia sempervirens*), taraire (*Belschmiedia taraire*), pukatea (*Laurelia novæ-zealandiæ*), and hinau (*Elæocarpus dentatus*), and air-dry tests on taraire and pukatea. Green tests on rimu structural timbers, and air-dry tests on insignis pine and rimu structural timbers. Nail-holding study on New Zealand timbers commenced. Routine examination of box-bindings in connection with standard specifications.

Timber Physics.—Microscopic study of insignis pine. Study of fibres of New Zealand native and exotic woods suitable for paper-manufacture. Shrinkage and specific-gravity studies on locally-grown pondosa pine.

Wood-preservation.—Preservative treatment of locally-grown exotic species suitable for telegraph-poles commenced. Investigations made into the possibility of preserving local timbers with water-soluble preservatives.

Derived Products.—Laboratory and semi-commercial pulping tests on New Zealand timbers suitable for paper-making. Commercial tests on some species commenced. Utilization of bled kauri-gum continued.

Industrial Investigations.—Detailed report on timber-production in New Zealand. Revision of New Zealand's grading rules for building-timbers into one uniform classification commended. Floatation methods developed for tawa.

Pathology.—Commercial treatment developed for sap-stain in white-pine. Survey of insects introduced on imported forest-produce completed and clauses drawn up for an Order in Council to inspect and quarantine insect-infested forest-produce.

Silvicultural Research.

The two main silvicultural problems in the Dominion, presenting entirely different conditions, are the native-forest types and the exotic plantations. Of the first mentioned, the podocarp type, which is the most extensive and likewise the most important economically, presents the greatest difficulty, and much research work in this connection is proceeding, but much still remains to be accomplished. The two remaining types—viz., the kauri type and the *Nothofagus* type—regenerate freely by natural means, and their silvicultural treatment is therefore not such a difficult matter. The inventory giving detailed information in regard to growth, yield, &c., of our exotic plantations was completed towards the close of the year and will prove of very great value in formulating future working plans for these forests.

Cultural treatment here, except in a small way, has been delayed owing to the lack of a market for the sale of thinnings, and the cost of carrying out the work. When it is remembered that the State plantations cover 134,000 acres, the financial burden herein involved can be readily appreciated. It is hoped, however, that with the establishment of a wood-pulp and paper industry our plantations will be more extensively utilized.

At present the main silvicultural operations are concentrated on selecting the best planting species, securing seed from specially selected acclimatized parent trees in the locality where the seedlings are to be planted, and experimental thinning of small plantation-plots.

Improved Planting and Nursery Technique.

The use of machinery, improved planting methods, and large-scale operations, more particularly in Rotorua region, have enabled nursery and plantation costs to be reduced to bed-rock, and it is unlikely that any further reduction of any consequence of field costs under these two main headings will be possible for at least some time to come. These splendid results have only been achieved by the continued zeal, enthusiasm, and co-operation of all Forest officers.

Sand-dunes.

The work of reclaiming and stabilizing the sand-dunes area at the mouth of the Rangitikei River, which has been in hand for several years, is now practically completed, with satisfactory results, and the experience and data thus gained will be of immense value should it be decided to treat other sand-drift areas in a similar manner.

Destructive Forest-insects.

As will be seen from the more detailed report which appears in another portion of this report, good progress continues to be made in this important line of research. The work accomplished to date shows that the present-day forest fauna of New Zealand is composite, there being an interaction of indigenous exotic elements, the latter being the more injurious to forest economy. To successfully grapple with this problem it is deemed essential that the following recommendations be given effect to as soon as it is possible to do so:—

(1) A comprehensive system of fire protection of all indigenous and exotic forests.

(2) The reduction of most exotic wild mammals.

(3) Bird-establishment. Rigorous protection and development of the indigenous avifauna.

(4) The introduction of a practicable quarantine system to check the entry of exotic insects and the movements of exotic insects already established, but as yet of restricted ravage.

Forest-protection.

Ravages of Forest Vermin.—Deer and wild pigs still constitute a serious menace to the community by the destruction of young forest-growth and consequent prevention of regeneration, damage to cereal and root crops, and the very serious mortality caused by the latter pest to flocks of young lambs.

Payment of bonuses for the killing of pigs and deer has been continued on the same basis as last year, and although 12,966 pig-snouts and 5,795 deer-tails were paid for in this way, yet owing to the natural increase of the animals some more wholesale method of reduction or extermination must be evolved to definitely reduce the herds to safe and reasonable limits. Experiments to this end are being continued, and are detailed in Chapter III of this report.

The Timber Industry of New Zealand.

During the year the production of sawn timber fell considerably lower than was required to fill the normal demands of the industry. Owing, however, to over-production during the previous two years, millers still had large stocks on hand despite the curtailment in production referred to. A further decrease in production appears to be necessary during the current year to enable the industry to resume its normal operation.

As a result of these accumulated stocks and trade-depression, the prices of many lines depreciated considerably, due not only to reduction in list prices by the various organizations, but also to varying discounts offered by individual operators to effect quick sales. To meet the over-production, reduced buying-power, and slackened demand, representations of the sawmilling industry appealed to the Government for an increased duty on imported timbers. The Tariff Commission inquired into the position and, following its report, the duty was considerably increased.

To further aid the utilization and market extension of local timbers, a Committee was set up consisting of representatives of all the interested Government Departments. It was primarily decided that certain definite improvements were necessary to the local industry, these including—

(1) A revision of the present variable grading rules in operation throughout the Dominion, to reach one universal grading system.

(2) The ready supply of seasoned timber, involving longer seasoning periods and improved seasoning practices.

(3) Improved manufacture of the product, including docked ends, evenly-sawn boards, &c.

The sawmillers co-operated with the Committee, which drew up a uniform classification and grading-system for our native building-timbers, based on specified size and occurrence of defects. This, it is considered, will result in a more balanced sale of the product of the log, thus finding a use for all classes. The new rules will come into force during the current year and will be used as a basis for the ordering of all Government timber-supplies.

Exports of Forest-produce.

The export of sawn timber during 1927 was the lowest experienced by the trade for over thirty years. White-pine, which accounts for approximately 75 per cent. of our total export, was the main sufferer. Overstocking during previous years, a poor dairy season in Australia, and the serious competition of lower-priced Baltic and North American timbers have all combined to affect the white-pine trade. Indeed, the position is still serious at the present time, and with more than ample stocks in hand Australian buyers are not likely to increase their orders for some time.

Rimu also continues to suffer from the competition of North American and Baltic timbers, especially for flooring and lining purposes.

Beech was again exported in record quantities, and this species, due to the excellent manner in which it has been graded and marketed, has obtained an export market which can still increase considerably. The present market is mostly confined to clean-grade timber only, but millers have been strenuously endeavouring during the past two years to develop a market for the inferior grades. Present indications point to a fair prospect of success in this direction.

The restrictions on the export of timber imposed in 1918 were repealed towards the end of the year, and operators are now at liberty to export without restrictions. It is not anticipated, however, owing to the reasons mentioned above, that the export trade will increase for some time to come.

Imports of Forest-produce.

Softwood timbers decreased in both quality and value imported, and totalled 33,276,000 ft. b.m. for 1927, or over 7,000,000 ft. b.m. below the peak trade experienced during the previous year.

The main species of softwoods imported were again Douglas fir, white and red cedar, hemlock, spruce, and Californian redwood from Canada and the United States, and spruce from Baltic ports.

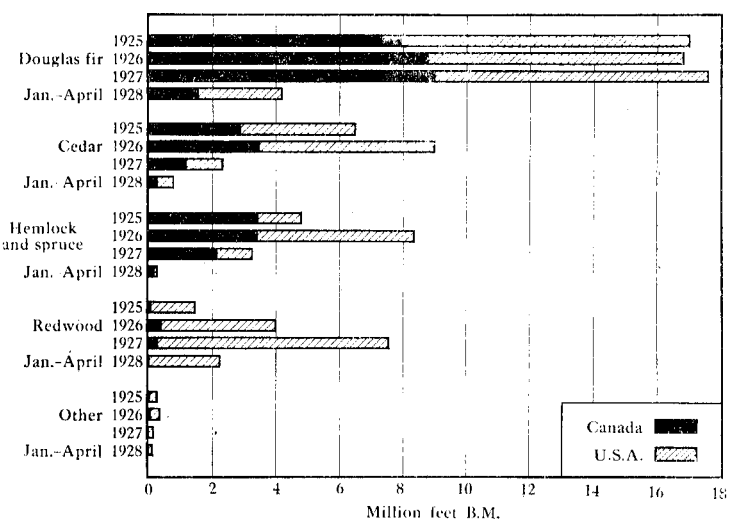
Imports of Softwoods into New Zealand from Canada and the United States of America for Calendar Years 1925–27.

(Expressed in terms of feet board measure.)

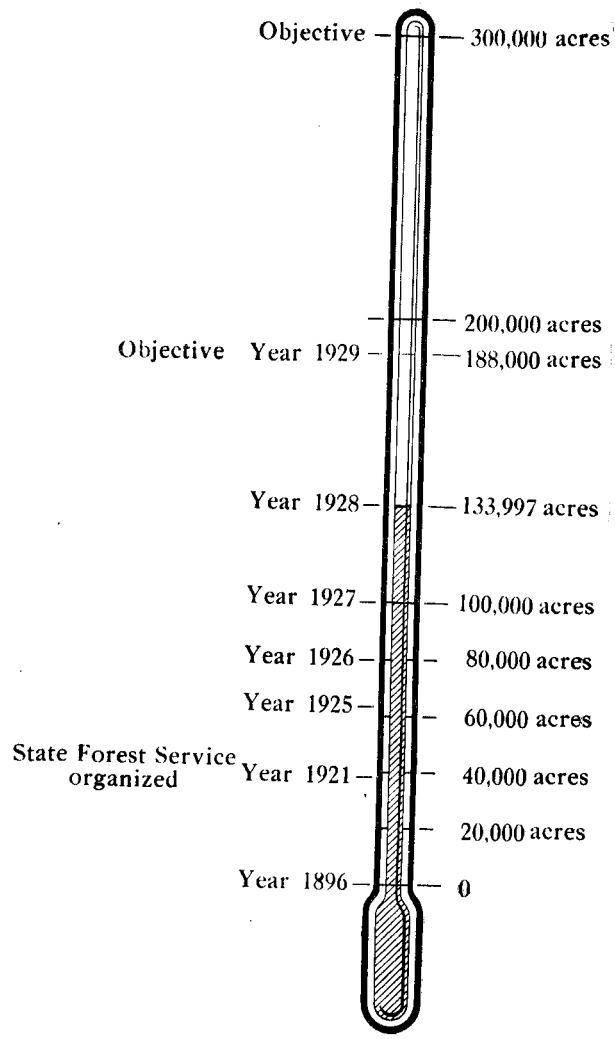
Species.	Canada.				United States America.			
	1925.	1926.	1927.	1st January to 31st March, 1928.	1925.	1926.	1927.	1st January to 31st March, 1928.
Douglas fir	7,940,000	8,787,000	9,001,000	1,555,000	9,167,000	8,034,000	8,637,000	2,652,000
Cedar	2,870,000	3,475,000	1,187,000	267,000	3,638,000	5,536,000	1,203,000	517,000
Hemlock and spruce ..	3,434,000	3,407,000	2,106,000	208,000	1,385,000	4,981,000	1,165,000	81,000
Redwood	60,000	400,000	285,000	28,000	1,400,000	3,600,000	7,298,000	2,194,000
Other	10,000	80,000	16,000	7,000	276,000	370,000	130,000	120,000
Totals ..	14,314,000	16,149,000	12,595,000	2,065,000	15,866,000	22,521,000	18,433,000	5,564,000

Grand total, Canada and United States: 1925, 30,180,000; 1926, 38,670,000; 1927, 31,028,000; January to March, 1928, 7,629,000.

The change in the trade, at first evident in 1926, was more strongly developed during the year. Redwood is now firmly established as a weatherboarding-timber, and not only has it almost completely displaced western red-cedar but it is becoming a serious rival to our own excellent native species. The decreasing quantities of western red-cedar now imported are used mainly for joinery purposes. Sawn hemlock, which for two or three years found a ready market as an interior finishing and lining timber, has now almost disappeared from the market for these purposes, due to many local bodies having classed it with white-pine as a species very subject to borer-infestation, and consequently prohibiting its use in general house-building. Douglas fir still finds a ready market, and during 1927 again experienced a record trade. Dairy-produce containers manufactured from hemlock and spruce continue to find favour on local markets.



Graph of Importations of Softwood Lumber from Canada and United States of America for the Calendar Years 1924–27.



STATE PLANTATIONS ESTABLISHED FROM 1896 TO 1928 AND FOREST SERVICE TREE-PLANTING OBJECTIVE.

The Work Ahead.

The revised afforestation programme for 1928–29 provides for the establishment of at least 54,000 acres of new plantations and the direct seeding formation by power drilling, spot sowing, &c., of an additional 13,000 acres.

It is expected that this will necessitate the employment of approximately 1,500 men per day during the winter months.

In co-operation with the Customs Department, steps will be taken to issue amended regulations in respect to the importation of timber, to reduce to a minimum the possibility of the introduction of forest-insect pests by such means. This is a measure which is long overdue.

Experiments to further improve planting and nursery technique are in hand, and several new machines, planting tools, &c., will be tried out in the coming season.

The present fire-fighting methods and organization will be strengthened and improved as a result of the experience gained during the past year.

Experimental work in connection with the destruction of pigs and deer will be continued, and it is hoped that an early solution of this problem will be found.

Further research work will be undertaken by the Branch of Forest Products, with the object of ensuring a closer utilization of the log by reducing the present mill waste in conversion. A survey of the possibilities of utilizing such waste in the manufacture of by-products will also be made.

CHAPTER II.—THE STATE FOREST SERVICE.

The year's afforestation programme, resulting in the establishment of approximately 35,000 acres and the maintenance and safeguarding of 134,000 acres of growing trees, has been carried out with very little increase in the permanent personnel of the Department. This has been possible only with the complete and loyal co-operation of all officers of the Service.

The resignation of one of the specially-trained senior technical officers is regretfully recorded, and other resignations have unfortunately been received which will involve the loss of several responsible members of the staff whose qualifications and energies have substantially contributed to the carrying-out of the Service's increasing programme and whose positions it will be difficult to fill. All these officers resigned to take better-paid appointments with private companies.

The Engineer in Forest Products continues in carrying on a co-operative experiment with the Forest Products Laboratory, Madison, U.S.A., and on his return to the Dominion it is expected that valuable information and data will be available in the furtherance of forest-utilization in New Zealand.

A statistical analysis of the distribution of the staff of the Service is appended.

STATE FOREST SERVICE ORGANIZATION.

Distribution of Permanent Staff as at 31st March, 1928.

Forest Conservation Region.	Administrative Officers.	Chief Inspector.	Technical and Special Officers.	Conservators.	Clerical Staff.	Forest Rangers.	Forest Guards and Others.	Total Permanent Staff for Years ended 31st March, 1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Auckland ..	..	..	1	1	3	4	2	11	9	8	6	6	6	7	8
Rotorua ..	..	..	2	1	3	9	5	20	21	23	19	20	21	20	20
Wellington ..	..	..	..	1	4	5	3	13	9	10	8	7	7	5	6
Nelson	..	..	..	..	1	2	3	6	6	7	7	7	7	6	7
Westland ..	..	..	..	..	1	2	4	..	7	9	8	5	6	6	8	7
Canterbury-Otago..	..	..	..	..	1	3	10	7	21	23	19	20	19	18	21	18
Southland ..	..	..	..	..	1	2	4	..	7	7	6	6	6	6	6	7
Central Office ..	2	1	4	..	16	1	1	25	26	25	24	25	24	25	24
Totals ..	2	1	7	7	35	40	18	110	111	106	95	96	95	99	97

Comparison of Total Employees.

	Year.							
	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
Permanent staff	97	99	95	96	95	106	111	110
Temporary officers	8	10	15	23	24	28	31	34
Labourers*	168	181	244	280	368	483	764	1,400†
Total	273	290	354	399	487	617	906	1,544

* As at September in each year. † Forecast.

UNEMPLOYMENT.

It has long been recognized both in England and on the Continent that tree-planting is an occupation peculiarly adapted for the absorption of seasonal unemployed labour. Planting methods are easily learnt by any one of average intelligence, and as the planting season extends over the winter months, when unemployment is usually at its height, this activity provides an outlet for the use of unskilled labour in an out-of-door healthy but rigorous employment, which is not mere "relief work," but must ultimately prove of great national value.

Last year approximately eight hundred men were given work of this nature, and plans have been completed for the employment this season of at least twelve hundred workers on productive forestry, in addition to the semi-permanent standing personnel.

CHAPTER III.—THE STATE FORESTS.

1. GENERAL.

Summary of Areas under Control.

The total area of State forests, provisional State forests, &c., under the Service control at the end of the fiscal year was 7,708,489 acres, a year's net increase of 81,645 acres as compared with the previous year's figures. In other words, 11·66 of the superficial area of the Dominion is now dedicated under the Forests Act.

Several extensive bush-clad areas of partly merchantable and partly protection forest have not yet been proclaimed under the Forests Act, but it is anticipated that success in this direction will be attained in the near future. Negotiations in progress at the end of the year resulted in the acquisition of substantial areas of land for forestation purposes, and figures in regard to these will appear in next year's statement.

For detailed figures the reader is referred to Appendix I of this report.

Legislation.

The only legislation relating to forestry enacted during the year under review is contained in the Wellington City and Suburban Water-supply Act, 1927, and section 28 of the Finance Act, 1927 (No. 2).

By the Wellington City and Suburban Water-supply Act, 1927, a total area of 67,165 acres of land (including 63,578 acres of State forest) was vested in the Wellington City Council for water-supply, forestry, recreation, and other purposes, and is now administered by the Wellington City and Suburban Water-supply Board established under the same Act.

Section 28 of the Finance Act, 1927 (No. 2), authorized every County Council to make, in each financial year, a levy, not exceeding ½d. per 100 ft. board measure, on sawn timber converted from native trees within the county that have not been planted.

Forest Reconnaissance, Demarcation, and Survey.

It is recognized that the permanent management of our forests cannot be undertaken without a detailed stocktaking or inventory of the forest assets, and this important branch of Service activity has been pushed steadily forward.

In Auckland region a further investigation made of the proposed access from the Main Trunk line to the timbered areas in East Taupo County showed that such access was possible by reasonable grades and at reasonable cost. An extensive reconnaissance of the forested lands in West Taupo County that have not yet been fully explored was contemplated, but had to be postponed owing to the demands of more urgent work.

Topographical surveys of about 6,220 acres and 3,250 acres required for afforestation at Riverhead and Maramarua respectively were completed, in addition to 2,900 acres of milling-bush.

In Rotorua region 44,000 acres of plantation survey and 36,000 acres of topographical survey were completed, besides 415 miles of fire-break side-line demarcation and road-lines. Reconnaissance surveys of 11,000 acres of provisional State-forest areas were also accomplished.

Extensive topographical and layout surveys were done at Karioi Plantation, Wellington region, as a preliminary to the new year's planting, the total area in this respect being nearly 11,000 acres. Approximately 3,360 acres of Native land and State forest were also subjected to reconnaissance surveys.

The high beech country surrounding the headwaters of the Clarence and Waiau Rivers, North Canterbury, was explored, and, as this bush is mainly protection forest of great value for the regulation of stream-flow and prevention of erosion, it is desirable to have it dedicated under the Forests Act.

Reconnaissance surveys were made over an aggregate area of 47,944 acres of State forests in Catlins, Port Craig, Stewart Island, Waikaia, and Longwood districts, Southland region, and the forests classified under the headings of merchantable, non-merchantable, and grazing. This disclosed that, in round figures, 28,000 acres comprised merchantable timber, and about 17,000 acres were non-merchantable or protection forests. Too much stress cannot be placed upon the value of the data thus secured.

2. Finance.

Receipts.

The forest receipts for the past financial year from all sources were £115,398, details of which, together with comparisons over a period of three years, are enumerated hereunder:—

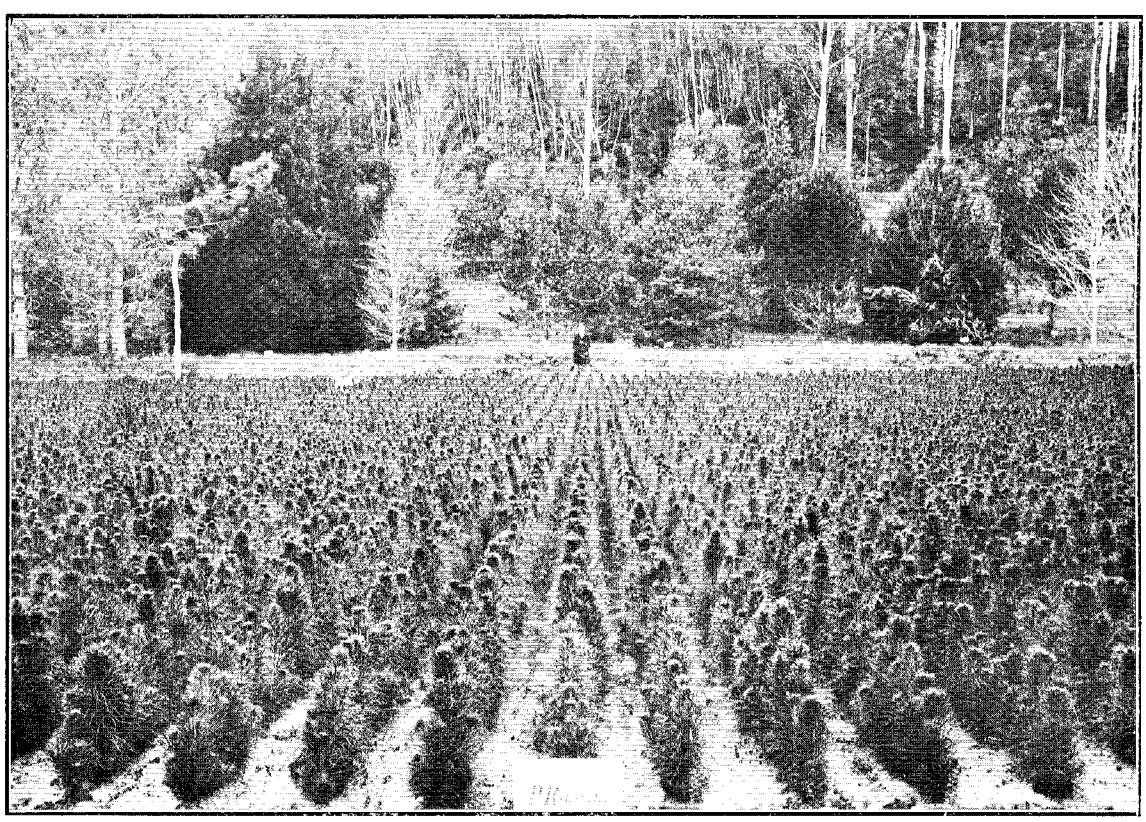
Item.	1927–8.		1926–27.		1925–26.		1924–25.	
	£	£	£	£	£	£	£	£
Forest receipts—								
Timber-sales	75,756		85,542		107,122		124,918	
Timber royalties	5,274		3,816		6,464		5,427	
Timber trespass	354		71		83		239	
Leases—								
Grazing	3,088		2,806		2,527		2,252	
Sawmill-sites, industrial, &c.	1,845		1,225		1,646		1,252	
License and transfer fees	121		117		113		170	
Miscellaneous licenses	102		280		167		107	
Permits—Grazing and miscellaneous	333		456		564		825	
Kauri-gum	132		238		627		764	
Fees for inspections and reports	703		620		318		324	
Interest on overdue promissory notes	135		213		149		120	
Rental of houses	80		92		77		43	
Opossum revenue	4,098		4,680		4,074		2,785	
Miscellaneous	2,209		544		..		..	
National Endowment Account allocation	9,898		14,114		17,044		11,247	
	104,128		114,814		140,975		150,473	
Less adjustments	..		749		1,969		296	
		104,128		114,065		139,006		150,177
Nurseries and plantations—								
Trees	7,711		10,229		10,281		8,704	
Seeds	1,667		1,934		1,510		970	
Firewood and poles	276		178		115		150	
Grazing	438		854		565		511	
Rental of houses	879		763		672		656	
Miscellaneous	299		543		401		301	
		11,270		14,501		13,544		11,292
Totals		115,398		128,566		152,550		161,469

Payments.

The net expenditure from the State Forests Account for the past financial year was £363,331, a detailed analysis of which is set out hereunder; also comparisons with the year 1925–26 and 1924–25.

Item.	1927–28.		1926–27.		1925–26.		1924–25.	
	£	£	£	£	£	£	£	£
Fixed charges and staff salaries—								
Interest and loan expenses	..	35,040	..	29,077	..	28,132	..	24,136
Allocation of revenue—								
National Endowment Account	13,885		15,659		9,741		12,612	
Local-body payments	6,983		9,061		6,141		257	
		20,868		24,720		15,882		12,869
Staff salaries—								
Capital	16,476		17,075		11,103		9,035	
Operational	27,194		22,783		25,912		22,394	
		43,670		39,858		37,015		31,429
Management, establishment, and development—								
Capital charges—								
Indigenous State forests — Buildings, equipment, &c.	3,474		4,204		3,082		2,792	
Fire-fighting equipment, &c.	182		73		38		125	
Educational—Reference library, &c.	180		107		213		109	
Research and experimental equipment	2,059		2,402		3,615		1,750	
Afforestation—Nurseries and plantations	108,876		78,418		61,315		47,864	
Sand-dune reclamation	1,966		2,312		2,595		2,318	
		116,737		87,516		70,858		54,949
Operational expenses—								
Indigenous State forests and general	15,840		17,839		15,500		14,670	
Fire-prevention	3,166		1,524		1,553		1,405	
Educational—Publications, &c.	472		1,094		1,164		819	
Utilization and silvicultural research	5,181		2,472		2,158		2,847	
Preparation of planting plans, &c.	2,918		1,611		1,358		1,196	
Miscellaneous	257		744		74		533	
		27,834		25,284		21,807		21,470
Land-purchases—								
Indigenous forest areas	830		18,639		16,161		105,993	
Plantation-extension	18,352		11,181		17,764		476	
		19,182		29,820		33,925		106,469
Totals	..	263,331		236,275		207,619		251,322

Trayed Seedlings for disposal to Farmers, etc.



One-year Transplants for Extensive Afforestation Purposes.

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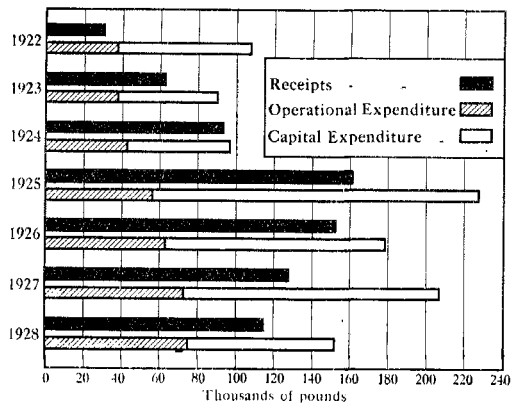


COMPARISON OF THE FOREST INCOME AND EXPENDITURES FOR THE PERIOD 1922–28.

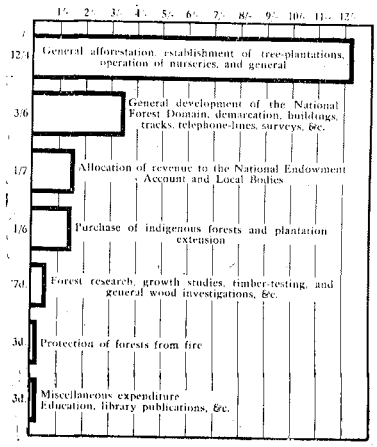


DIAGRAM SHOWING THE APPORTIONMENT OF EACH £1 OF THE SERVICE EXPENDITURE FOR THE FISCAL YEAR ENDED 31ST MARCH, 1928.

Counties' Share in State Forest Timber-sale Receipts.

In accordance with the provisions of section 17 of the Finance Act, 1924, an amount of £6,982 17s. 4d. was paid to thirty-three local authorities during the year under review.

The counties are entitled to one-fifth of the net proceeds of rents, royalties, and sales of native timber growing on Crown lands set apart by Proclamation as State forest or provisional State forest. The counties have submitted proposals to expend the above sum mainly on improvements to roads providing access to State forests, and therefore to the benefit of backblock settlers.

National Endowment Account's Share in State Forest Timber-sale Receipts.

The National Endowment Account has benefited by the receipt of £13,884 15s. 9d., being the net proceeds, in accordance with section 39 of the Forests Act, 1921–22, of timber sales and royalties from national-endowment lands being administered by the Service.

3. OPERATION.

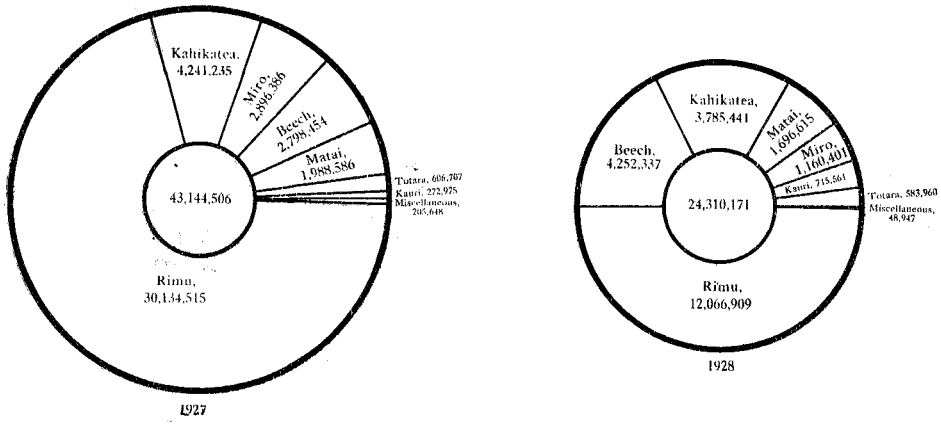
Timber-sales.

The attached schedule shows a marked falling-off in the quantity of timber sold and the quantity cut from State forests during 1927–28, as compared with previous years, and is striking evidence of the depression through which the milling industry has been passing.

Fiscal Year.	Number of Sales.	Value of Timber sold during the Year.	Quantity of Timber sold during the Year.	Receipts from all Timber Licenses in Force during the Year.	Quantity cut from State Forests during the Year.
		£	Feet, B.M.	£	Feet, B.M.
1927–28	49	34,000	24,310,100	91,282	36,654,000
1926–27	52	52,125	43,144,000	103,524	64,639,000
1925–26	65	80,565	73,659,000	130,132	79,009,000
1924–25	54	96,158	69,253,000	134,731	102,369,900
1923–24	61	266,388	212,085,000	68,295	52,297,000
1922–23	52	95,357	78,830,000	47,462	..
1921–22	40	38,208	35,669,000	24,320	..
1920–21	5	17,055	6,987,000	16,815	..

NOTE.—Receipts shown above for the periods 1920–21 to 1923–24 do not include the half-share of receipts paid into the National Endowment Account from State forests on national-endowment lands.

Reference to the attached graphs shows the quantities of the various species comprised in Forest Service timber-sales for the last two years.



STATISTICS OF THE SERVICE TIMBER-SALES FOR YEARS ENDED 31ST MARCH, 1927–28.
QUANTITIES SHOWN IN FEET BOARD MEASURE

Timber-export Regulations.

Owing to the depressed state of the milling industry, restrictions on the export of our indigenous timbers were somewhat relaxed during the past year, but all export was subject to permit, of which 280 were issued, a slight increase over the figures for the previous year. The majority of these related to white-pine and rimu.

Full details in regard to quantities, species, &c., of timber exported and imported for the calender year ending 31st December, 1927, will be found in Chapter V and Appendix V.

Forest-improvements.

As opportunity and funds permit, access to and through State forests is being steadily improved by means of new tracks and roads, and the maintenance of existing ones.

With the creation of new afforestation projects, the promotion of many miles of fire-breaks, tracks, telephone-lines, &c., are essential before extensive planting can be commenced, and in this respect much good work has been accomplished, as will be seen by a reference to Appendix II of the report. In Puketi State Forest, North Auckland, accommodation was provided for a resident forest guard by the erection of a five-roomed cottage, and in other regions existing buildings were renovated where necessary, and maintained in good repair.

Recreational Use of the Forests.

The ever-increasing number of motor-cars and consequent improvement of main arterial highways each year renders transport more mobile and speedy, and enables and encourages holidaymakers to seek their recreation farther afield than was possible before the motor era. This is as it should be, and it is pleasing to report that the exceptionally fine summer of 1927–28 tempted many more persons than formerly to seek and enjoy the pleasures of camping, tramping, picnicking, &c., in their own priceless national heritage, the forest domain. Visitors who respect the forest law are always welcome, as it is recognized that only with an increasing knowledge and appreciation of the peerless beauty of our native forests, extending from subtropical in the far North to subalpine in the South, can a "forest conscience" be fully developed. Visitors generally "played the game" by the Service, and showed by the few reported acts of vandalism, careless fire-lighting, &c., that they valued the privileges afforded them.

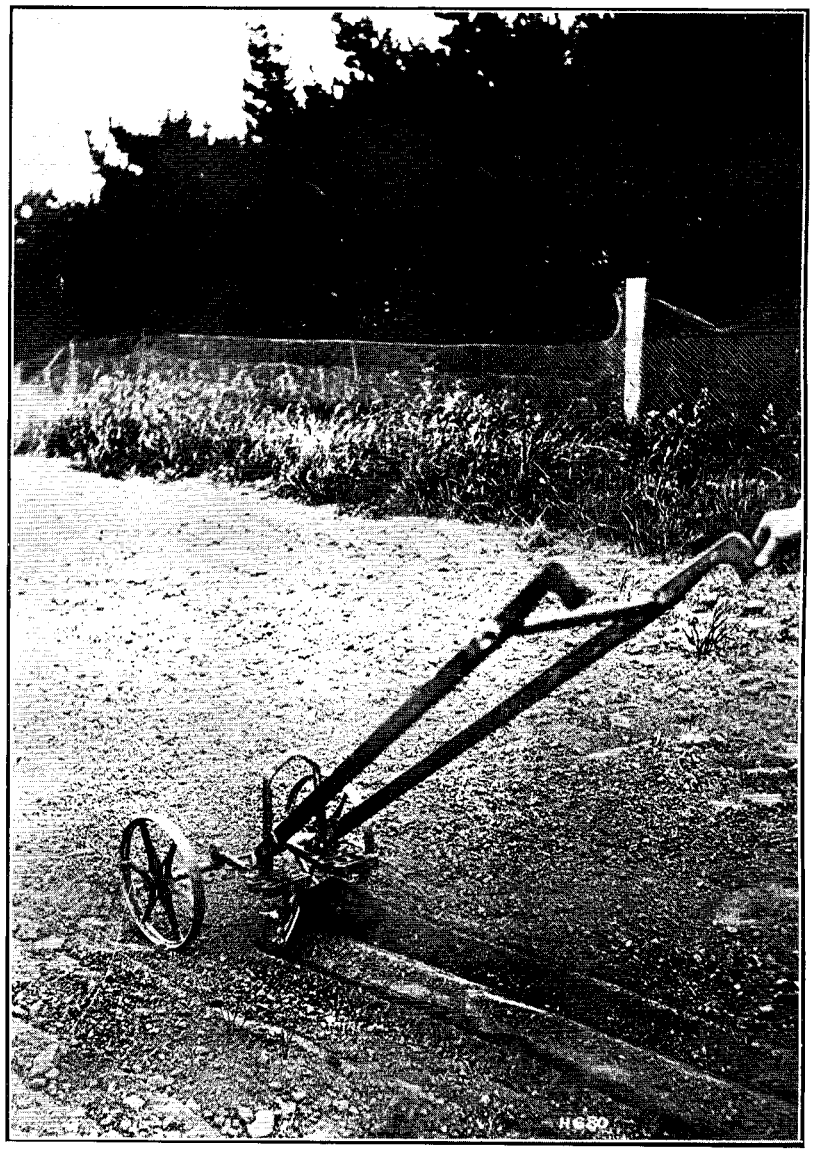
Honorary Forest Rangers.

Good reports continue to be received from all regions of the valuable assistance rendered by the honorary forest-ranger corps, which now numbers ninety-five. In many cases these gentlemen reside in remote outback districts which can only be visited at rare intervals by Forest officers, and without such voluntary service many cases of illegal lighting of fires, timber trespass, poaching, &c., would perforce go undetected. Once again the Service records its very hearty thanks to its co-workers in the cause of forest-conservation. Three new appointments were made during 1927–28, while resignations, deaths, &c., accounted for four others.

4. FOREST-PROTECTION.

Fire Districts.

New fire districts have been constituted to safeguard the afforestation projects at Riverhead and Maramarua in Auckland region, and Karioi in Wellington region, and similar action will shortly be taken with respect to Golden Downs Plantation, Nelson. The value of the fire district principle, although comparatively new to New Zealand—it was authorized by statute six years ago—is now almost unanimously recognized and respected, so that cases of burning-off without the permission or supervision of a Forest officer by landowners who are legally required to obtain such permission are becoming fewer each year. Thirty-two fire districts have been constituted to date, involving an area, in round figures, of 1,610,000 acres.



THE MONTGOMERY SEED-BAND MAKER.

The practical application of ideas likely to further the efficiency of forest technique and reduce costs is encouraged among officers.

BEECH (NOTHOFAGUS) NATURAL REGENERATION ON A BURNT-OVER AREA.

[*To face page 10.*

Cheney Spark-nullifier.

This very useful device for the prevention of sparks from locomotives, log-haulers, &c., has now been almost universally adopted by sawmillers operating in State forests, and with few exceptions appears to be giving general satisfaction. It has undoubtedly been of great value in reducing fire danger from the sources mentioned.

Forest-fires.

As the summer of 1927 28 was the driest and warmest experienced for many years, a very high fire hazard obtained for several weeks throughout practically the whole Dominion, and although many serious fires occurred, resulting in unusually heavy losses, the damage would have been infinitely greater but for the excellent fire-patrol system maintained by the Service and the increasing vigilance of its field officers, combined with the voluntary assistance in many cases by landowners, sawmillers, &c., which enabled fires to be extinguished in their incipient stages. The most destructive fire from a forestry viewpoint was the loss of approximately 60 acres of eighteen-year-old conifers at Hanmer Springs. The fire originated in the old hotel at Jollies Pass at an early hour in the morning, and, fanned by a strong north-west wind, sparks were carried a distance of nearly half a mile to the plantation, where they probably smouldered for some time amongst the pine-needles before bursting into flames. The burnt trees can be utilized for pit props, firewood, &c., and these and other avenues of exploitation are being investigated.

A serious fire occurred in Puhipuhi Plantation (North Auckland), where 300 acres of conifers and eucalypts were destroyed, and on Westland experimental area about 1,000 three-year-old trees were burned. Many private plantations also suffered severely, the greatest losses being at Nelson, where areas of exotic trees aggregating 100 acres were ruined.

Considering the magnitude and number of fires generally, those in State indigenous forests were comparatively few, although fairly severe losses took place in Nelson region during January, February, and March (the maximum fire hazard period), when for several weeks almost continuous fires raged with great intensity. A survey of the position disclosed that approximately 3,000 acres of State forests were burned over, with an estimated timber loss of £1,000, while extensive areas of scenic and other reserves and unoccupied Crown lands were also swept by fire.

It is evident that some of the fires got out of control through carelessness in burning-off on adjoining lands, &c., and where cases can be established steps will be taken to prosecute the offenders in terms of the Forests Act.

ANALYSIS OF ALL REPORTED FOREST-FIRES IN STATE FORESTS.

Forest-conservation Region.	Forest-fires: Number, Character, and Area.					Money Value of Forest-wealth destroyed.		
	Number detected.	Timber Land burned.	Cut-over Land burned.	Scrub Land burned.	Total Area burned over.	Merchantable Timber.	Valuable Regrowth.	Total Value.
		Acres.	Acres.	Acres.	Acres.	£ s. d.	£ s. d.	£ s. d.
Auckland ..	13	304	141	183	628	604 0 0	..	604 0 0
Rotorua ..	..	..	..	..	..	..	..	..
Wellington	8	12	195	520	727	75 0 0	10 0 0	85 0 0
Nelson-Marlborough	..	3,931	..	..	3,931	1,057 0 0	..	1,057 0 0
Westland ..	1	46	..	..	..	10 0 0	..	10 0 0
Canterbury-Otago	7	¾	..	.200	260¾	1,969 6 0	..	1,969 6 10
Southland	8	..	337	..	337	..	..	..
Totals	39	4,353¾	673	903	5,929¾	3,715 6 10	10 0 0	3,725 6 10

Forest-conservation Region.	Cost of Protection, Prevention, Detection, and Control of State Forests.					Origin of Forest-fires.			
	Fire-patrol Force.	Wages Cost.	Fire-equipment Cost.	Locomotion Cost.	Total Cost.	Sawmilling Operators.	Travellers, Sportsmen, &c.	Land-clearing Operators.	Unknown Agencies.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.				
Auckland	10	872 0 0	..	100 0 0	972 0 0	..	10	..	2
Rotorua ..	11	773 0 0	157 0 0	37 14 2	967 14 2	..	..	..	..
Wellington	3	159 9 0	5 6	43 10 0	203 4 6	..	..	4	2
Nelson-Marlborough	3	1,300 0 0	..	69 0 0	1,369 0 0	..	..	..	..
Westland ..	3	41 11 2	..	..	41 11 2	..	..	..	1
Canterbury-Otago	17	916 15 6	..	25 7 4	942 2 10	..	6	1	..
Southland ..	2	184 6 0	..	24 9 0	208 15 0	5	2	..	1
Totals	49	4,247 1 8	157 5 6	300 0 6	4,704 7 8	5	18	5	6

5. Forest Wild Life.

Native Birds.

The pioneer work carried out by the New Zealand Native Bird Protection Society in rousing the public to the importance of the preservation of our beautiful and in many respects unique bird-life is having good results, as reports from all regions tend to show that the rapid decrease of our native birds so noticeable some years ago has been arrested in a measure at least. State forests are treated as bird-sanctuaries, consequently carrying and using shot-guns and pea-rifles therein are prohibited, and all illicit shooting is punished where a conviction can be secured. Several such cases were detected throughout the year, and in every instance where a *prima facie* case could be established legal proceedings were taken and fines inflicted on the offenders.

Opossums.

The trapping returns for the 1927 season show a falling-off compared with the previous year, but were slightly higher than in 1925. The following figures show the skins secured for the past five years: 1922–23, 54,357; 1923–24, 109,905; 1924–25, 95,639; 1925–26, 145,778; 1926–27, 157,480; 1927–28, 149,000.

The opossum revenue and share of license fees paid to the State Forests Account amounted to £4,097 18s., or £581 15s. less than that received for 1926–27.

Once again permits to trap in Wellington forest region exceeded those from any other part of the Dominion, and the skins secured represented about 50 per cent. of the grand total.

Unfortunately, trapping out of season was again rife, and many convictions were recorded, while others could not be proceeded with owing to difficulty in securing evidence.

An offence frequently indulged in and difficult to prove, unless the offender is caught red-handed, is poisoning by the use of cyanide, a wholesale method of destruction of animals and bird life which cannot be too strongly condemned. To combat this evil the efforts of the Service have been directed towards a more rigorous control and inspection of trapping-areas and trapping-lines.

Statistical returns from regions show that the number of opossums has decreased, and a close season in at least some districts seems essential to allow the animals to multiply.

The question of introducing new stock in order to improve the class and colour of the fur becomes more important each year, as only by this means can a good-quality high-grade skin be assured.

The prices of skins sold at public auction ranged from 17s. 10d. to 3s. 6d. each.

The revenue received from the opossum industry is largely devoted towards the cost of destruction of deer, pigs, and goats throughout New Zealand.

Deer.

The investigations made by the Service over a period of years prove conclusively that deer are a serious forest menace by their destruction of young growth and prevention of forest-regeneration; nor are their depredations confined solely to the forests, as in many instances they have been known to eat or destroy entire paddocks of cereal crops, turnips, &c.

Payment of the bounty of 2s. per tail, mentioned in last year's report, was again continued, and 5,795 tails were paid for in this manner. A special party was engaged by the Internal Affairs Department for deer-destruction on Stewart Island. Their operations extended over two months, during which time seventy head were destroyed. The establishment of small "salt licks" in all badly infested areas throughout New Zealand has been completed, and to further combat this ever-increasing pest the advisability of carrying out poisoning experiments on the lines successfully tried in North America is under consideration. It is obvious, however, that this method can only be tried out in specially selected localities, where no stock exists and water-supplies will not be polluted. As regional reports disclosed that deer were using the "salt licks," larger and more permanent ones were established with a view to attracting the animals in greater numbers to vantage-points where they can be more readily destroyed by shooting parties. In an attempt to turn the deer liability into an asset, State encouragement and assistance have been given to a private firm in its endeavours to develop an overseas market for the export of deer-carcasses, and, though sufficient time has not elapsed to definitely prove the financial success of the venture, there is every prospect that exporting venison can be made a profitable undertaking. Markets have been found for deer-hides, antlers, &c., and when this business has been fully developed it is hoped that the cost of extermination will be reduced by the sale of these commodities.

Wild Pigs.

Funds for the destruction of wild pigs in certain localities in the Dominion were again provided on the same basis as last year, and payment was made in respect to 12,966 pig-snouts.

Poisoning experiments have not yet proved successful upon a large scale, and tests of different poisons and baits will be further experimented with this winter. As in the past, great care will be exercised in the carrying-out of these experiments, for the success of a suitable poison for pig-destruction must be governed largely by the fact whether or not it will be harmful to stock.

Suitable financial provision has been made for the continued control of the pig menace during the current fiscal year, and, as heretofore, this work will be administered by the Service.

Goats.

The increase of goats and the resultant damage in State forests has caused grave concern, and, although only certain portions of New Zealand are at present affected, organized plans are being prepared to exterminate this vermin. The profitable utilization of sun-dried goat-skins has been

investigated, and a market for the hides seems likely. Experience shows that, next to deer, goats are the animals most destructive to forest-life, for they browse on all kinds of vegetation and young growth from sea-level to snow-line, and consequently forest-regeneration is seriously retarded, if not actually destroyed. Fortunately, they can be killed fairly readily by organized shooting parties, and for this reason are never likely to become such a serious pest as deer or pigs.

6. Establishment of Man-made Forests.

State Forestation.

The greatly increased planting operations in Rotorua region and the creation of new plantation units in other parts of the Dominion have enabled the Service to more than reach the year's objective of 25,000 acres of new exotic plantations, as in all 35,106 acres were actually established, which brings the total to date 133,997 acres.

It is apparent, therefore, that the State planting programme of 300,000 acres of trees by the year 1935, which when it was first announced was no doubt regarded in some quarters as somewhat ambitious and unduly optimistic, is now well in advance of schedule, and if the present planting-rate be maintained for the next seven years—and indications all point to this end—the grand total at the end of that period will be considerably in excess of the figure mentioned.

The policy of using only inferior-quality land for planting purposes will be continued, and by this means not only are overhead costs reduced to a minimum, but waste lands which might otherwise be a liability to the State, owing to the propagation of weeds and noxious vermin, will be turned into a very valuable asset.

Summarized figures in regard to the year's planting appear below:—

Summary of Operations on State Plantations during the Year ended 31st March, 1928, and Total Area planted.

Forest Plantation.	Number of Trees planted.	New Area planted.	Total Area planted in Trees, 1896–1928.
		Acres.	Acres.
Riverhead	1,807,149	2,615	2,668
Kaingaroa	12,889,730	22,768	75,503
Karioi	906,205	1,306	1,306
Golden Downs	335,920	494	494
Hanmer Springs	567,725	779	7,900
Balmoral	3,638,716	5,358	13,016
Blue Mountains	692,635	988	3,256
Experiment group	50,855	798	2,537
Plantations on maintenance basis	..	..	27,317
Totals	21,346,635	35,106	133,997

Local-government Forest Activities.

In the North Island a slight advance has been made in regard to what may be called communal forestry.

During the season the total area forested in this way is estimated to be 300 acres, planted by thirty-two local governing bodies, the principal ones being:—Thames Valley Power Board, 20 acres (for transmission-poles); Rangitikei County Council, 17 acres; Whangarei Borough Council, 58 acres; Tauranga Harbour Board, 36 acres; Whakatane County Council, 27 acres; and Wellington City Council, 30 acres.

Local-body planting in the South Island, although not perhaps so rapid as in the North, is making steady progress, and as the wisdom of foresting waste and useless portions of the public domain become more universally recognized greater strides in this direction may be confidently expected. Tree-planting was carried out by seventeen local bodies, including Christchurch and Dunedin City Councils, Selwyn Plantation Board, and Mackenzie, Waimari, and Ashburton County Councils. The largest individual planting was done by Dunèdin City Council, which planted 605,800 trees, and proposes next year to afforest a total area of 1,000 acres.

Industrial Companies.

Two coal-mining companies in the North Island suffered rather severe losses from fire during the very dry summer, 240 acres of wattle-trees (Acacia) intended for use as mine-props being totally destroyed. This may possibly necessitate replanting part of the area in eucalypts.

A third company carries out an annual planting programme of about 30 acres of insignis pine.

Tree-planting Companies and Syndicates.

Two public afforestation companies ceased to exist and several new ones were registered during the year. It is interesting to note that a number of companies financed by Australian capital have secured extensive planting-areas and are now operating in the Dominion. Final statistics of the

year's planting are not yet to hand, but reports show that generally good work has been done, and one group alone established approximately 27,500 acres of new plantations, making a grand total to date of over 82,000 acres. Three private companies planted 120 acres last season. Although certain afforestation companies have been formed in the South Island, planting operations there so far have been practically nil.

Forest-extension.

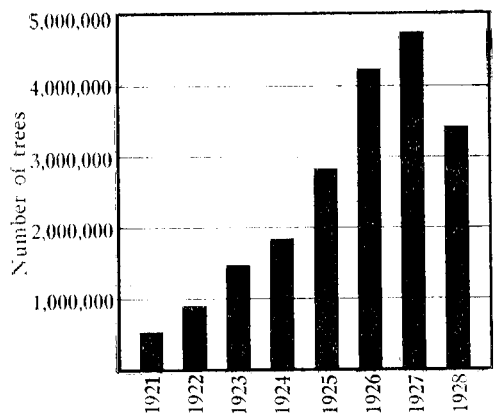
Sales of trees and tree-seeds were not so well maintained as during the previous two years, although substantially in excess of the business transacted during the year ended 31st March, 1925. This is doubtless accounted for by the fact that the numerous afforestation companies which commenced active operations within the period first mentioned came to the State for their initial stock requirements, whereas since that date they have had ample time to establish nurseries and raise their own planting stock. It will probably be found, therefore, that sales may show a further decline in future years. The primary function of the Service is, however, to encourage tree-planting amongst the farming community, and supply true to type, hardy, well-rooted tree stock for the production of farm timber and fuel, and the formation of shelter-belts for stock, wind-breaks, &c.; and despite the bad season from a farming point of view tree-sales for this purpose continue to show a slight increase in the North Island.

In furthering the policy referred to good work has been done by numerous public lectures, winter-show exhibits, wireless, broadcasted addresses, and newspaper and magazine articles.

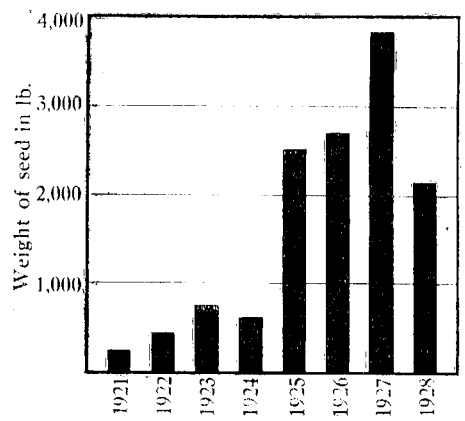
A schedule of State sales of trees and seeds for the past ten years is appended.

Year.	Trees for planting. (Number.)	Forest-tree Seeds. (Weight in Pounds.)	Year.	Trees for planting. (Number.)	Forest-tree Seeds. (Weight in Pounds.)
1919	420,412	132	1924	1,839,512	618
1920	277,235	130	1925	2,831,932	2,529*
1921	520,702	240	1926	4,226,174	2,692*
1922	897,552	436	1927	4,760,490	3,861*
1923	1,475,581	746	1928	3,481,398	2,156*

* Includes domestic and overseas sales.



Comparison of Forest Service Sales of Young Forest Trees from 1921 to 1928.



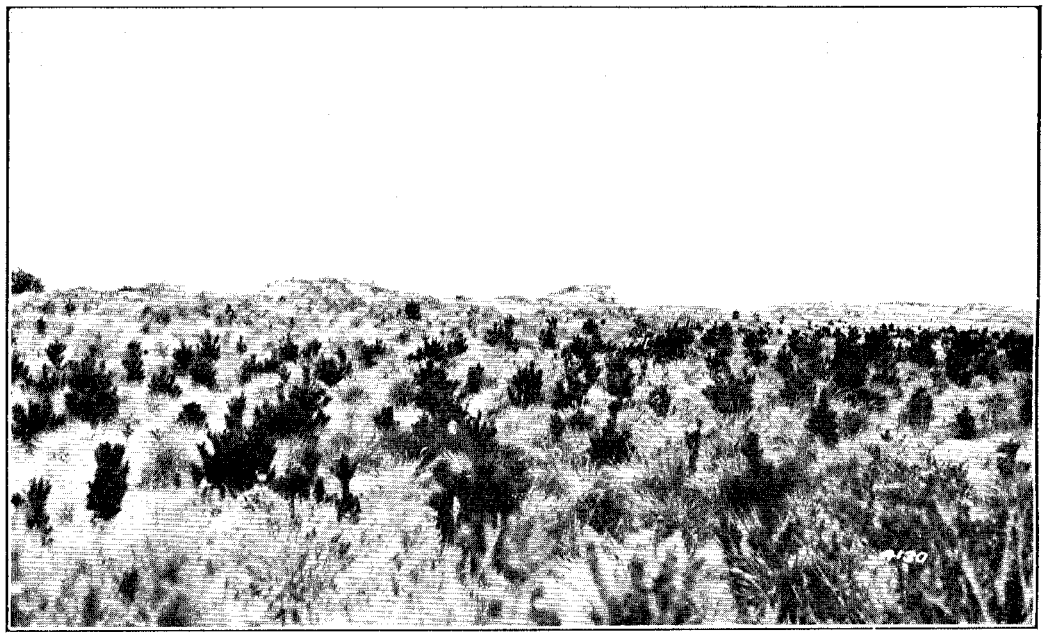
Comparison of Forest Service Sales of Forest Tree-seeds from 1921 to 1928.

7. Forestry in Schools.

Very encouraging results are now being obtained from the earlier propaganda work in connection with school forestry as outlined in previous reports, and, thanks to the continued co-operation of the Department of Education and the marked enthusiasm displayed by all Inspectors and teachers associated with the movement, it can now be definitely asserted that a scheme of elementary forestry study in all its aspects is firmly established in the majority of our country primary schools. The practice of making free gifts of small parcels of trees to plant school-grounds and packets of seed for nursery sowing has been continued, and in the North Island 7,148 trees and 65 lb. of seed were distributed in this manner, whilst in the South Island 82 lb. of seed were likewise made available. As a result, many school plantations have now been formed, and in the Taranaki Education District alone thirty-seven schools have already planted an aggregate area of 30½ acres. In many instances the areas planted were small patches of waste or weed-infested ground lying near the school, and eventually a beautiful and valuable plantation will replace a plot which was formerly not only a blot on the landscape, but a menace to adjoining land as well.

Apart, however, from the purely materialistic aspect, the inculcation in the young idea of a love of the beautiful and a greater interest in the world of Nature must raise public opinion in the future to a higher plane in the matter of tree-consciousness.

If plans at present under consideration can be brought to fruition a still greater impetus will be given to this important movement in the near future.



Rangitikei Sand-dune Reclamation Operations: Pines successfully established on Fixed Dunes.

The Proclamation of Fire Districts is an Important Link in Forest-fire Prevention.

Area established by Drill Sowing, Rotorua District: Seed sown 1922.

[To face page 11

CHAPTER IV.—RESEARCH AND EXPERIMENTS.

1. Forest-management.

It is gratifying to record that the compilation of an inventory of the plantation was finally completed. This marks a most important forward step, as the inventory gives such detailed information in regard to the growth and yield of the plantations that it can be fittingly described as one of the key works to national afforestation in the Dominion, and will prove most valuable in the formulation of future working plans for the plantations.

The preparation of planting plans, one of the main forestry fundamentals, is proceeding, but owing to the many urgent calls upon the staff rapid progress has not been possible. It is intended, however, to devote more time to this important aspect of our operations during the coming year.

Mill-conversion studies have been continued, and the year's investigations were devoted to the various defects common in many forests and their results on timber appraisals. Another year will be necessary to complete this important study, when it is hoped that from the data obtained timber-measuring will be put on a firmer and more scientific basis.

Improved System of Communication.

Owing to the rapid increase in area of the exotic plantations, improved telephone communication between the various units and the central station, &c., became urgently necessary, and a special portable telephone was designed and constructed at low cost. The apparatus gave excellent results, and worked efficiently on the existing telephone-line.

Ten portable Army second-hand telephones were obtained from England, but were not so successful.

It is interesting to note that the use of radio communication in forestry operations is now having world-wide recognition. In Ontario modern short-wave stations have been set up for intercommunication, and also for use with fire-patrolling aircraft. The British Columbia Forest Service operates a long line of stations, and the Vanokoro Kauri Timber Co. in the Solomon Islands has two powerful stations situated on different islands in that group.

2. Forest Entomology.

With the concurrence of the Department of Agriculture, the services of Mr. David Miller, M.Sc., Government Entomologist, were again made available to the Service to continue his forest-insect survey, and investigations were carried out in the provinces of Marlborough and Taranaki, and in the Hamilton-Taupo-Rotorua district, regarding the ravages, spread, &c., of the *Sirex juvencus* saw-fly. It was found that this insect is commonly distributed throughout these areas, but confines its attention to weakened, suppressed, or injured trees, and although it is capable of ovipositing in healthy trees no injury results. Evidence is not lacking that the Australian longhorn beetles of eucalyptus have become established in the Dominion, as in one district they were discovered attacking living *E. globulus* trees over twenty years old. The larvæ of the beetles arrive under the bark of imported hardwood poles, and until some stricter examination is made compulsory in regard to all imported timber this danger will continue to exist. It is hoped that suitable action to deal with this serious menace will be taken in the near future. The same remarks, unfortunately, apply to imported redwood timber, in consignments of which the North American species of Siricidæ (the same group to which *Sirex* belongs) have ben discovered in a live state. Under Mr. Miller's direction a comprehensive survey was also made of the exotic plantations in Taranaki and Canterbury, and the information obtained has been carefully recorded for future reference.

The study of Scolytid weevils attacking milled timber and of the two-toothed long-horn beetle attacking seasoned timber are under way, but have not yet been completed. It is evident, however, that the latter insect is widely established in wooden buildings and is causing considerable damage.

Several consignments of the parasite of the gum-tree weevil were received through the courtesy of the South African Entomological Service, and after being reared were distributed throughout the Dominion.

The ladybird-beetle (*Rhizobius ventralis*) was also distributed to combat the gum-tree scale in those districts where the scale has become epidemic. This insect is rapidly spreading through the North Island, and upon request consignments can be sent to any district where the scale makes its appearance.

Two parasites of the steel-blue saw-fly (*Sirex juvencus*) have been located and studied by the English entomological authorities, and arrangements have been made for consignments of these parasites to be despatched to New Zealand next summer.

Towards the close of the year Mr. Miller was appointed to the important position of Chief of the Department of Entomology, Cawthron Institute, Nelson, which, it is regretfully announced, compelled him to relinquish his active connection with the Service. It has been possible, however, to retain his services in an advisory capacity until the primary projected activities in forest entomology are completed—*i.e.*, till the 31st March, 1929.

3. Forest Ecology.

Part II of the "Monograph on the New Zealand Beech Forests," by Dr. L. Cockayne, F.R.S., the Service Honorary Botanist, was printed, and is now on public sale. This very valuable publication consists of fifty-nine pages, profusely illustrated, and deals with our beech forests from the practical and economic standpoint.

The same author has rewritten his book "The Vegetation of New Zealand." The new edition will contain a new classification of the indigenous forests, with additional information as to their character and development, which will prove of great interest and value to all forestry students.

At the instigation of the Service, Mr. F. E. Hutchinson, B.Sc.F., of the Canterbury School of Forestry, carried out an investigation into certain phases of forest utilization, under the following headings: "Utilization in Bush," "Logging Process," "Mill and Manufacture." A one-acre plot was demarcated in a typical West Coast logging-area, and carefully measured before the bushmen commenced felling. The purpose of the investigation was, first, to secure a complete inventory of all woody material; and, second, to obtain data regarding the total quantity of merchantable timber removed from the area, the quantity, form, and species of material regarded as useful, and all other points bearing on the complete utilization of the stand prior to the area being logged. Losses in snigging, loading, and conversion were analysed and recorded, and the summarized results will be most valuable for future comparative purposes. After the milling-timber had all been removed from the plot a careful cruise was made of the remaining secondary timbers with a view to arriving at the probable percentage of waste from this source. Owing to the small area of the plot investigated, and the fact that one forest-type only was studied, the accuracy of the figures obtained as applicable to other parts of New Zealand should perhaps be accepted with certain reservations; but, nevertheless, a conservative view of the summary of the resulting data demonstrates that there is abundant room for improvement in all stages of our present system of forest-utilization.

4. Forest Botany.

Towards the end of the year the New Zealand Government, at the suggestion of the Department of Scientific and Industrial Research, took advantage of the presence in Australia of Dr. A. W. Hill, C.M.G., F.R.S., F.L.S., Director of the Royal Botanic Gardens, Kew, to invite this distinguished botanist to the Dominion. Dr. Hill, who came from England at the invitation of the Commonwealth Government to advise on matters of economic plant-development and to confer with the various Directors of the botanic gardens in the Australian States, fortunately found it possible to so arrange his itinerary as to enable him to spend a few weeks in this country. The Forest Service was pleased to render all the assistance in its power to make Dr. Hill's visit both profitable and instructive, and arranged for the Secretary of Forestry (Mr. E. Phillips Turner, F.R.G.S.) and the Honorary Botanist, Dr. L. Cockayne, F.R.S., to accompany him through the Dominion. Dr. Hill subsequently embodied his views and observations in a report to the Government.

Rangitikei Sand-dune Experimental Station.

The ideal weather conditions which prevailed during the planting season, combined with the experience acquired from several years of experimental work at this station, enabled a record to be established, and 426 acres were planted with marram-grass, as compared with 372 for the previous year, making a total to date of 1,471 acres. Moreover, planting-costs were again substantially reduced, and have now reached practically bed-rock figures. Planting-stock for 1928–29 will be available from a nursery situated closer to the area to be treated than has been the case hitherto, and this will materially reduce transport costs and tend to speed up next year's operations.

The planting of exotic conifers on fixed marram-covered dunes was continued, and 150,590 trees were established on an area of 219 acres. The total area now under trees is 534 acres. Certain damage by deer has been noticed, and as the trees increase in growth and afford more protection worse damage must occur unless measures are taken to deal with the pest.

The experimental planting of flax (*Phormium tenax*) mentioned in last year's report was continued over an increased area with separate plots of young and old plants to ascertain which will prove the more suitable for commercial purposes. From the results obtained there appears to be a fair prospect of flax-planting being successful as a commercial undertaking, provided the areas to be planted are judiciously chosen. The trial planting of flax in the rear of the fore-dune as a wind-break for the young trees, which was commenced in 1926–27, has been only partially successful.

The planting of lupin (*Lupinus arboreus*) for the purpose of reinforcing the fore-dune was continued, and the results obtained from the previous year's operations are distinctly promising.

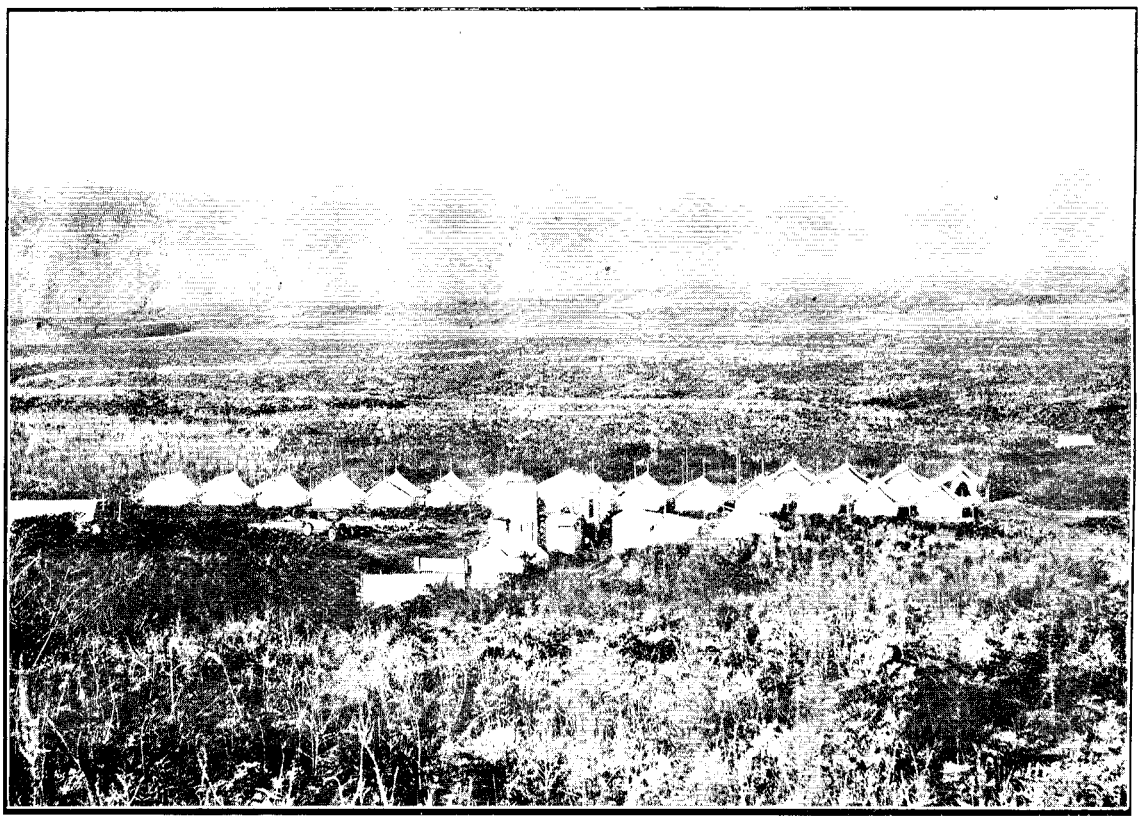
The seedlings raised at Tangimoana Nursery for the year are estimated to total 650,000, being mainly *Pinus radiata*, with lesser quantities of *P. muricata* and *P. pinaster*.

5. Silvicultural Investigations.

Westland Forest Experiment Station.

The area planted at this station for the year just closed has exceeded all previous efforts, and an area of 400 acres was afforested with 257,500 trees, which comprised mainly *Pinus radiata*, *P. muricata*, *Cupressus Lawsoniana*, *C. macrocarpa*, and *Eucalyptus Gunnii*, with smaller lots of five other species. The area thus planted to date is 1,250 acres.

Of the species mentioned, *C. Lawsoniana* was planted in cut lines through heavy undergrowth, and made highly satisfactory growth. *E. Gunnii* was also successful, *C. macrocarpa* partially so, while *P. radiata* and *P. muricata* were almost complete failures, which seems to prove conclusively that these two species are not suited to the moist soil conditions of the plantation. Taking a line through the various species tried out since the plantation was established, it can safely be said that *Thuya plicata* has given most promising results, closely followed by *C. Lawsoniana*, *Cryptomeria japonica* and *P. ponderosa*. (A further reference to this area will be found in Appendix II.)



A Typical Camp for Tree-planters on the Kaingaroa Pumice Land.

Under-planting in Native Forests.
Exotic specie successfully established in dense undergrowth.

[*To face page 16.*

Tapping of Kauri for Resin.

Periodical examinations have been made of the kauri-trees which were experimentally tapped for resin (*vide* report for 1927), and a further collection of gum will be made this winter. The interim results to date go to show that taps cut to the depth of the tough pithy tissue just outside the wood give best results; that taps at the top of the trunk give better yields than those at the base; that freshing or rewounding after the first and subsequent collections are essential; that better-quality gum and less waste and cost in collection are obtained during winter tapping; and that larger-sized trees give increased yields of gum. Other interesting phenomena have been observed and recorded, but further trials and observations will be necessary to prove the truth of these.

The Westland Podocarp Rain Forest.

References have been made in previous reports to the ecological survey of the podocarp forests of Westland initiated by Mr. C. E. Foweraker, of the staff of Canterbury College School of Forestry, in 1920, and continued during the succeeding four summers. This work was recommenced by Mr. Foweraker, in association with Mr. F. E. Hutchison, during the summer of 1927–28, and investigations made from the silvical viewpoint.

A working plan was drawn up, the basis of the investigation being to discover and formulate the means whereby these forest areas, both virgin and logged, may be placed under an efficient and economically satisfactory system of forest-management, and investigations were concentrated on the regenerative powers of the podocarp forests, the field-work being carried out principally on the Westland Forest Experiment Station near Rimu, an area of 7,000 acres, which provides a most suitable series of forest types for investigation, being represented by mature virgin forest, pole and sapling virgin stands, and second-growth vegetation. Eleven sample plots, varying in size from one-tenth acre to one acre were established amongst these various types, and all available data collected therefrom.

Investigations into the seed production and germination of the podocarps show that the dicœcious habit of this class—as the rimu, for example (in which individual trees are either wholly "male" or wholly "female")—is chiefly responsible for such a small proportion as 3 to 6 per cent. of ripe seed per tree. Laboratory tests are being made of seed collected during the late summer and autumn to ascertain what is the most suitable collecting-period for germination purposes, and further research is necessary to determine what constitutes a "good" or a "poor" seed year.

One of the chief factors governing the successful natural regeneration of the podocarps is the question of light-requirements, and indications show that the rimu requires shelter and not shade, an interesting fact being that although little regeneration can be found under mature stands it is frequently prolific on cut-over areas adjacent to living seed-bearing trees.

From the scanty evidence at present available, the best reproduction seems to occur on areas where the mineral soil has been exposed by logging, burning, and cattle-grazing, whilst cut-over areas densely covered with broad-leaf scrub are notably deficient in rimu seedlings. Further work will, however, be necessary to substantiate this theory.

To attempt, however, to advance any hypothesis in regard to the growth and increment rate of the native bush on the basis of the few existing sample plots would be absurd, and until the next five years affords a series of measurements on stands of all ages and in all conditions nothing further may safely be said than that the only two cases of authentic data available prove conclusively that in the pole stage the rimu stands make quite appreciable increment, with an annual increase, under certain conditions of $\frac{1}{10}$ in. diameter at breast-height.

The present stage of the investigation opens up many interesting theories in regard to the habits of rimu, replacement by natural means within a reasonable time, &c., but these cannot be tested without further study and research, which will be undertaken in future seasons.

6. Forestation Studies.

Further silvicultural experiments were carried out during the year, and the co-ordination of these operations was ensured by the following of prescribed standard schemes.

Trials of Planting Stock.

Trials were carried out in regional plantations to determine the best type of tree-stock (age and size), and the best season for planting, as applied to the local conditions. By such studies the percentage of losses in planting should be greatly reduced.

Underplanting of Native Bush.

A systematic measurement and observation was carried out on an underplanted area of State forest, near Mamaku, exotic conifers having been underplanted in this tawa forest in 1920.

Valuable information is being collected with reference to the shade-bearing capacities of the various conifers planted.

Experimental Nursery Technique—Rotorua.

Experiments for the improvement of nursery technique were continued, the following projects being given special attention:—

(1) Quality and germination trials with experimental seed lots.
(2) Pre-treatment of seed with various chemicals to determine a satisfactory fumigant against the introduction of seed-disease.

(3) Storage of seed under various conditions to find the maximum period for which it can be economically stored.
(4) Experimental treatment of nursery soils with various crops—blue lupin, mustard, vetches, oats, &c.
(5) Comparative methods of seed-sowing with improved appliances.

The control of grass-grub in nursery lines was again taken in hand, and smoke-screens from burnt sulphur-powder have so far proved effective in the Tapanui Nursery.

Manual of Forestation Practice.

The co-ordinated experience gained by regional trials over several years will shortly be embodied in a manual on forestation practice, which should prove of great value to officers of the Service.

Wrenching.

An experiment to ascertain the effect of wrenching of nursery stock upon survival, after planting out in the clay soil at Riverhead Plantation (Auckland), was carried out with insignis-pine seedlings. Unwrenched plants were 12 in. long when lifted—shoot 6 in. and root-system 6 in. Wrenched plants were 8 in. in length—4½ in. shoot and 3½ in. of root-system. The respective root-system consisted of a long single tap-root and of a branchy fibrous root.

No difference was found in the survivals six months after planting; but the unwrenched stock cost more to plant, as deeper spits had to be dug to prevent the tap-roots being bent or bunched during planting.

Establishment of Plantations by Direct Formation.

Further spot-sowing trials were carried out at Riverhead and Maramarua Plantations, and at Waipoua Forest Experiment Station. At the two former places ten plots of ten acres each were sown, the plots being selected on different parts of the areas representing various aspects and soil conditions. At Waipoua ten acres were sown. On the three areas the seed sown was of six species of pine, four other conifers, and five species of eucalypts. The seed was sown during the month of September at Maramarua, and in October at the other two stations. Unfortunately, dry weather set in about the time the sowing was completed, and results taken as a whole are not very encouraging. It is expected that a good deal of delayed germination may take place, and stocktaking results cannot, therefore, be considered as final. At Waipoua, pheasants, quail, and other birds devoured most of the pine-seed, and birds were also troublesome at Riverhead, and to a less extent at Maramarua. Mice took the larger seed at both Waipoua and Riverhead.

On the whole, the most promising species are Canary Island pine (24·5 per cent.), macrocarpa (34·2 per cent.), and *Eucalyptus eugenioides* (43·4 per cent.). Permanent sample plots, 1 square chain in area, have been established in all sown areas, and counts are made on these plots from time to time.

During 1928–29 it is proposed to sow 100 spots with a variety of species during each of the months April to September, at the five main stations in the region. Provided normal climatic conditions obtain, this test should afford reliable data in respect to the suitability of species and the best season for sowing.

Direct sowing was also continued at Kaingaroa where a further area of 2,345 acres was established; at Karioi, where 173 acres were dealt with; and on smaller areas at Golden Downs (Nelson), Hanmer, and Balmoral (Canterbury), and Waikaia (Southland). Improvements are still being made to the mechanism of seed-drills and an effective type of hand-sower will be given extensive trials during the forthcoming season.

7. Forest Economy.

Forest-products Investigations.

The utilization of forest waste has often erroneously been assumed to be the principal object of forest-products research. To be sure, this factor is one of primary importance, but is not of paramount importance in comparison with the large field which has to be explored. All the objectives of forest-products research, including waste-prevention, have been clearly expressed by Aldo Leopold, of the United States Forest Products Laboratory, as follows:—

(1) To increase the quantity of merchantable forest products by utilizing waste.
(2) To enhance the quality and hence the value of forest products by—(*a*) Controlling the properties of the material grown through manipulation of the growth process; (*b*) sorting the material to segregate the properties required in each use; (*c*) modifying the properties where sorting is not sufficient.

It is towards these ends that local forest-product studies are being directed.

The extensive range covered by this research can be visualized by quoting typical results. The completion of a survey of the timber industry resulted in a statistical analysis, giving, *inter alia*, details of mills cutting the minor native species. This has already resulted in an increased utilization of the latter, due to a reference system thus being established between consumers and suppliers. An article on woods for butter-boxes was responsible for the complete review of the species suitable for the export package of butter, and showed the manner by which little-used species can replace the high-priced standards at present in use. The completion of grading studies carried out in all districts of New Zealand has made it possible to revise the grading and classification rules for native building-timbers, and is designed to ensure a uniform grading throughout the Dominion. Flotation tests carried out on tawa resulted in methods being developed for the flotation of this valuable hardwood.

Strength tests carried out on green and air-dry material of four species of native and exotic woods, including taraire, pukatea, hinau, and redwood, have advanced the testing programme of the Forest Service to a point where internationally standardized tests have now been made on seventeen species of native and exotic woods. This has made possible the development of strength - specific - gravity laws for local timbers, enabling a very fair approximation of the various strength values of any timber to be made from a knowledge of specific gravity alone. The grading of structural timbers was further advanced by the completion of the testing of structural-sized specimens of rimu and insignis pine, correlating the strength properties with defects occurring. Visible defects are the basis of structural classification.

Signal progress was made in wood-preservation studies by the installation of a plant capable of butt-treating full-sized telegraph-poles. The co-operation of the Post and Telegraph Department on this project was secured, with the result that the latter has agreed to install on service lines treated locally-grown exotic poles. It is anticipated that many species which would be unsuited for other methods of utilization will be used in this manner.

Detailed examinations of the suitability of New Zealand native and exotic species for pulp and paper making on a laboratory scale were completed at the Pulp and Paper Laboratory of the Commonwealth Council for Scientific and Industrial Research. Commercial tests carried out in co-operation with the United States Forest Products Laboratory, Madison, Wisconsin, were also commenced. The Engineer in Forest Products was present at each of these series of tests. While the results are not yet complete, progress reports to hand indicate that the tests are entirely satisfactory.

Studies under Way and Investigations.

Altogether over thirty major investigations are in progress. These include: Sawmills and wood-waste survey; introduction of shop grades into New Zealand grading rules; wood requirements of wood-using secondary industries; statistical survey of sawmilling industry; woods for butter-boxes; uses for short lengths of timber; standardization of sizes, grades, and nomenclature for yard timber; utilization of little-used species; study of floating properties of New Zealand woods; physical properties of wood; air-seasoning of wood; basic mechanical properties of woods grown in New Zealand; grading rules and working-stresses for structural timbers; cross-arm tests; routine strength tests of plywood; test of box-bindings; study of nail-holding power of New Zealand woods; treatment of wood by non-pressure process; treatment of wood by pressure process; service-test records; routine examination of wood-preservatives; the pulping of thinnings from Rotorua plantations; suitability of New Zealand woods for pulp; microscopic structure of woods; kauri-bleeding; relation between durability and the chemical composition of woods; destructive distillation of native and exotic woods; relative resistance of untreated woods to borer-attack; relative resistance of untreated woods to decay; prevention of the introduction of forest and timber insects and fungi in imported forest products.

CHAPTER V.—GENERAL.

1. Report on the Timber Trade.

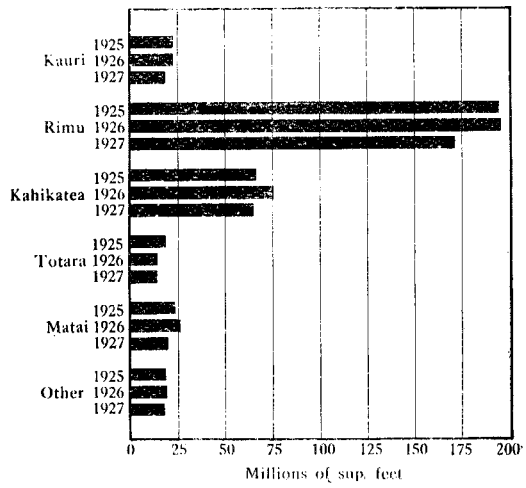
Production.

The following table, showing the reported output in feet board measure of the various species of timber from New Zealand sawmills during the years ended 31st March, 1925, 1926, and 1927, has been compiled from figures supplied by the Government Statistician.

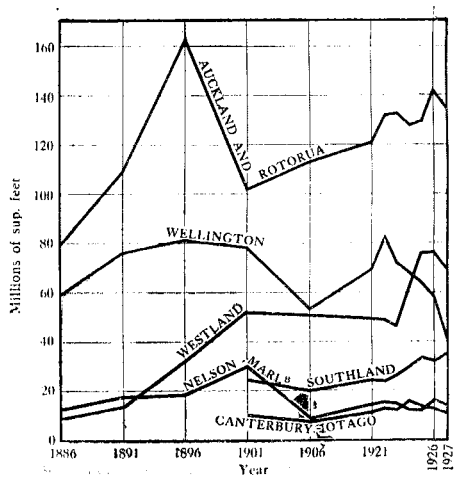
Reported Production of Sawn Timber by Species.

Species.	1925.		1926.		1927.	
	Feet, B.M.	Per cent.	Feet, B.M.	Per cent.	Feet, B.M.	Per cent.
Totals, all species ..	344,095,000	100·00	353,225,000	100·00	306,504,000	100·00
Kauri	22,892,000	6·66	22,766,000	6·44	18,475,000	6·02
Rimu	194,565,000	56·52	195,452,000	55·35	171,489,000	55·98
White-pine ..	66,539,000	19·38	75,635,000	21·40	65,328,000	21·30
Totara	18,507,000	5·38	14,110,000	4·00	14,179,000	4·62
Matai	23,392,000	6·79	26,141,000	7·40	19,380,000	6·32
Beech	7,439,000	2·16	8,701,000	2·46	8,596,000	2·80
Insignis pine ..	7,706,000	2·24	7,072,000	2·00	6,668,000	2·18
Other	3,055,000	0·87	3,348,000	0·95	2,389,000	0·78

The sawmill production as reported to the Government Statistician was approximately 307 million feet b.m. for the year ended 31st March, 1927. This represents a decrease of 13·1 per cent., and constitutes the lowest cut since 1924. The production for the year ended 31st March, 1928, is estimated at 310 million feet b.m.



Graph showing Production of Rough-sawn Timber for Years ended 31st March, 1925, 1926, and 1927.



Graph showing Trend of Sawn-timber Production by Forest Conservation Regions for the Period 1886 to 1927.

The trend of regional timber-production for the period 1886 to 1925 is shown in the accompanying graph. Auckland and Rotorua regions combined, together with Gisborne (*i.e.*, Auckland Province), maintained the premier position, although decreasing 12·6 per cent. in cut compared to 1926. Following the trend of the past four years, Westland now holds second place, having firmly replaced Wellington as second on the list. Wellington decreased most of the major provinces, and reflects not only the depression in trade, but also the rapid depletion of the easily accessible Main Trunk line forests. Southland again reported an increased cut, due not only to the early recovery from the recent slump, but also to the extension in operations of certain large millers in the district.

With the exception of totara, the production of all species for the year ended 31st March, 1927, was less than for the preceding period. It is also to be noted that, though totara reported a slight increase over the 1926 figures, the production, as in the latter year, fell considerably below that reported for the previous five years. Though rimu reported the largest actual decrease, amounting to 24 million feet b.m., this only amounted to 12·3 per cent. of the total cut of the species. The largest proportional decrease was experienced by matai, which decreased 7 million feet b.m., or 25·9 per cent. of the total cut.

The average f.o.r. mill value per 100 ft. b.m. (all species) for the year ended 31st March, 1927, was 19s. 2d., compared with 19s. 8d. for the preceding year.

Manufacturing Technique.

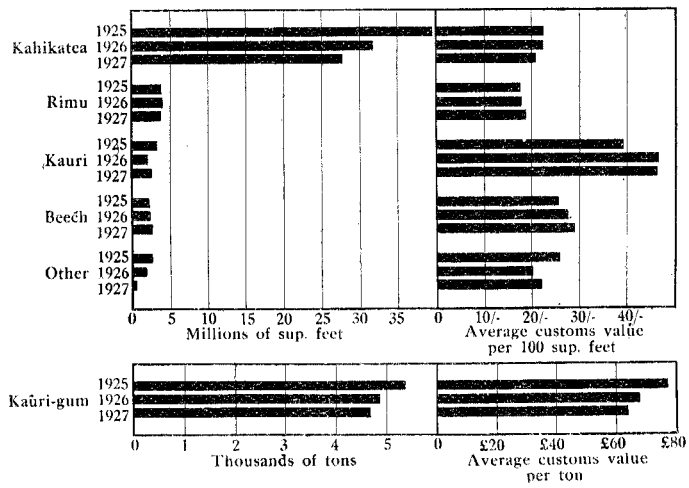
Manufacturing technique showed considerable improvement. Although mills were working at only a low percentage of their capacity, certain operators installed equipment of the latest types developed abroad, with a resultant marked improvement in their product, and correspondingly increased sales. Electrified sawmills and high-speed planers are typical improvements. As in former years, the Canadian type of log-carriage is becoming more widely known, with the increased milling of plantation timbers, portable rigs of the latest types are being installed.

Appreciation of correct drying practices is now being shown by an increasing number of operators. The propaganda on air-seasoning methods broadcasted by the State Forest Service are being noted by the industry, and throughout the country the practice of box-stacking, efficient filleting, and increased air-circulation throughout piles, can be clearly observed. Low pile foundations, in most cases within a few inches of the ground, the latter generally in a damp and sodden condition, remain the most serious defect in present-day milling practice. Although this statement has been reiterated in previous reports, it is felt that, as the matter is one of such vital importance and so easy to remedy, too much prominence cannot be given to it. In the dry kiln distinct progress has been made. A South Island merchant has already installed the first modern scientifically-controlled kiln to be erected in New Zealand, and at least six other operators intend to purchase similar kilns during the coming year.

Grading and marketing methods were studied, with the result that arrangements are now almost complete for inaugurating a uniform grading and classification system for the local industry, which it is felt will place native timbers on a fair competitive basis with imported timbers.

Exports.

The year ended 31st December, 1927, was the poorest experienced by the export trade for over thirty years, and followed the trend of the preceding year. It appears certain that from now onwards the trade will improve, although probably very slowly. The actual quantities exported for the last three years were 37,180,548 ft. b.m., valued at £425,928, in 1927; 41,953,879 ft. b.m., valued at £480,247, in 1926; and 51,549,439 ft. b.m., valued at £605,187, in 1925. Despite the rapid fall in quantity, however, the average f.o.b. value for all species maintained approximately the high level experienced in 1925, the figure for the three years being—1927, 22s. 11d.; 1926, 23s. 4d.; and 1925, 23s. 6d.



Graph showing Rough-sawn Timber and Kauri-gum Exports for Years ended 31st December, 1925–27.

The white-pine trade, with an exportation of 27,802,036 ft. b.m. and a unit value of 20s. 10d. per 100 ft. b.m. during 1927, compared with 31,767,504 ft. b.m. and a unit value of 22s. 6d. per 100 ft. b.m. for 1926, continued to experience the severe setback received in that year, and alone accounted for the whole decrease in the year's export trade. The causes of the depression in the white-pine trade, which is absorbed almost entirely by the Australian market for dairy-produce containers, are threefold: In the first place, the 1925 and 1926 dairy seasons in Australia were very poor, with a resultant low exportation of dairy-produce; secondly, the Australian trade in North American and Baltic boxes has increased by leaps and bounds during the past three years, due principally to the excellent condition and low price at which these boxes can be landed; and, thirdly, due to the large white-pine importations to Australia during 1924 and 1925 on a market which was already being lessened by the first two reasons mentioned. The result was that large stocks of white-pine accumulated in Australia for which a sale could not be found. From inquiries instituted recently it appears as if the market is still overstocked, and immediate relief at present seems remote.

During 1927 rimu exports totalled 384,366 ft. b.m., valued at 18s. 10d. per 100 ft. b.m., compared with 4,000,370 ft. b.m., valued at 18s. per 100 ft. b.m., exported in 1926. Rimu continues to move slowly on the Australian market, which has also been captured largely by North American and Baltic timbers, especially for flooring and lining purposes. To compete with these timbers on a price basis the f.o.b. price of rimu would require to be 14s. 6d. to 15s. 6d. per 100 ft. b.m., an almost impossible figure when it is considered that it is mainly clear grades which are exported.

The exports of kauri during 1927 amounted to 2,476,222 ft. b.m., valued at 46s. 2d. per 100 ft. b.m., compared with 1,987,046 ft. b.m., valued at 46s. 8d. per 100 ft. b.m. for 1926, thus indicating a steady trade. Price considerations debar this timber from any but special and luxury uses.

Beech, following the trend of former years, continues to report increased trade, 2,580,604 ft. b.m., valued at 28s. 11d. per 100 ft. b.m., being exported during the year. The excellent manner in which this timber is always supplied true to specification by the association handling its export trade has done much to establish a sound market in Australia. It is still, however, felt that a revision of the New Zealand grading-system and a detailed use-study of the export-market requirements would secure a more balanced utilization of the product of the log and extend the markets for this valuable hardwood.

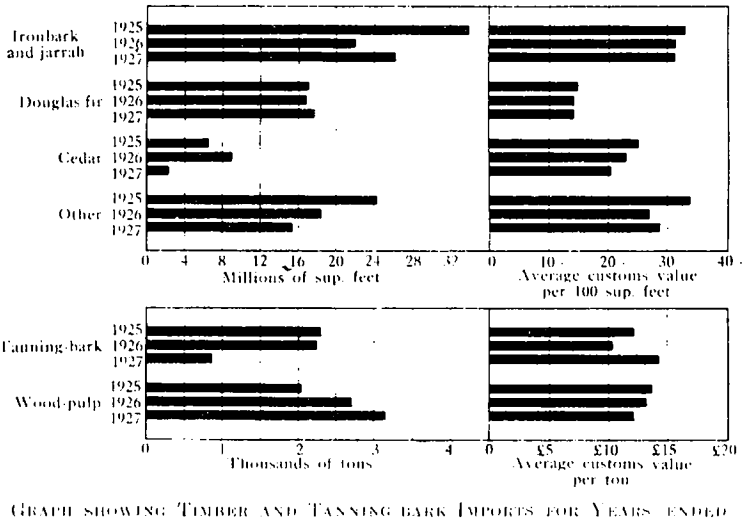
Kauri-gum exports continued to fall, and only 4,674 tons, of an average value of £64 per ton, was exported, compared with 4,877 tons, valued at £61 6s. per ton for 1926, and 5,370 tons, valued at £77 6s. per ton for 1925.

Imports.

New Zealand's import timber trade during the past seven years has considerably fluctuated. In 1918 the importation of sawn timber totalled only 10,000,000 ft. b.m. During the next three years the trade increased rapidly, and by 1921 had reached the high figure of 47,000,000 ft. b.m. During 1922, however, it fell again to 35,000,000 ft. b.m., only to show progressive increases on preceding years, reaching its peak value of 82,000,000 ft. b.m. in 1926. Market conditions and local activities have since made it quite evident that 1925 was an outstanding year as regards timber-importation, and one not likely to be surpassed.

During 1927 only 61,767,992 ft. b.m., valued at £784,719, were imported, compared with 66,503,872 ft. b.m., valued at £826,422 for 1925.

Hardwoods, though reporting a slight increase on the succeeding year, still maintained a level of approximately 20,000,000 ft. b.m. below 1925 figures, and reflect the low expenditure of Government Departments, Electric-power Boards, and local bodies.



Graph showing Timber and Tanning Bark Imports for Years ended 31st December, 1925 to 1927.

Softwoods, due to a declining timber market and possibly increased timber import duties, showed a marked decrease compared with the previous year, being only 33,000,000 ft. b.m., or approximately 7,000,000 ft. b.m. below 1926 figures. Despite this, however, Douglas fir experienced its best year in the history of the trade, with importations totalling 17,638,000 ft. b.m., or over half the total softwoods imported. Western red-cedar, so much in evidence during 1925 and 1926, was almost entirely displaced during the year on the local markets, importations totalling only 2,390,000 ft. b.m. during 1927, compared with 9,021,000 ft. b.m. during 1926. Corresponding, however, to this decrease in cedar, redwood importations increased from 3,636,000 ft. b.m. in 1926 to 7,583,000 ft. b.m. in 1927, reflecting the capture of the weatherboard market previously held by the former species. The advertising and price-reduction carried out by redwood-producers has resulted in a heavy trade being established for this product on the local markets. Sawn hemlock, used mainly for lining purposes, also declined severely, with importations of only 2,207,000 ft. b.m. during 1927, compared with 7,787,000 ft. b.m. in 1926. Its reputation for borer attack, combined with its prohibition for house-building by certain local bodies, has resulted in an almost complete disappearance of hemlock from the timber markets. Dairy-produce containers, however, manufactured from hemlock and spruce continue to find an increasing local market, importations of these commodities totalling 3,240,000 ft. b.m. during the year under review, compared with 2,504,000 ft. b.m. imported during 1926. The fact that exporters of produce in these containers receive a drawback duty discounts any advantage manufacturers of local boxes would have obtained from the increased Customs duties.

Markets.

Despite the severe fall in production, the moderately heavy importation and low exports resulted in an additional 238 ft. b.m. *per capita* being made available for a market which already had considerable surplus stocks, due to over-production during the preceding two years. The reasons for the latter were fully discussed in last year's report. The normal *per capita* consumption of timber in New Zealand is approximately 250 ft. b.m., and it is thus evident that production last year would have been insufficient had not such large stocks accumulated from former years. Provided, however, production is further reduced for the current year to enable operators to clear present stocks, it is anticipated that an early recovery in the industry will be experienced. Help for the local industry was, however, accomplished by two very important factors. Firstly, the revision of the Customs tariff on imported timbers resulted in a 3s. per 100 ft. b.m. increase in duty being granted in the small-size rough-sawn timber imported in large quantities for house-building into New Zealand. Other lines had varying additional imports placed on them. Secondly, the formulation of a revised classification and grading system for local timbers has resulted in the grades being defined on a definite specification basis, ensuring uniformity of supply throughout the Dominion. It is anticipated that the increased Customs duties, combined with the improved grading methods, which will come into operation in the year 1928-29, will do much to extend the markets for our local timbers.

Wholesale prices fell considerably, and notwithstanding cuts by various associations individual operators offered large discounts off list prices to effect quick sales. Taking both these factors into consideration, millers probably received poorer returns for their stocks than for many years past.

The railway-tariff charges on fencing-posts and fencing-materials generally were revised. Whereas formerly they were carried at firewood rates, the new regulations determined that they be carried at sawn-timber rates, unless the timber be carried as fencing-battens, and providing such battens did not exceed certain limited dimensions. It is considered that the new regulations would have the effect of limiting the trade in local 1 in. rough heart-fencing, as the increased freights will not permit this class of fencing to compete with imported palings. This question brings up the more general one of freight charges on sawmill offcuts, short and slabs, which unless used as firewood are charged at timber rates.

2. The Forest Atlas.

For the period under review, a total of twelve atlas maps were completed and together with eighty-three general plans were recorded under the permanent Forest Atlas.

These atlas maps cover an area of 171,507 acres, and make a recorded total of sixty-nine maps completed up to date, covering an area of 927,360 acres of State forests and plantations, which represent the permanent demarcation of 12·3 per cent. of the total area controlled by the Service. Topographical maps which are incidental to the systematic laying-out of fire-breaks, planting blocks and compartments, have been prepared for portions of Riverhead, Kaingaroa, Karioi, Golden Downs, Hanmer, Balmoral, and Blue Mountains Plantations, and maps of the species subsequently planted on these areas are under preparation. Seven maps of State forests have been certified by the Surveyor-General as required by section 25 of the Forests Act, 1921–22. Five atlas sheets were lithographed, from which a total of 1,000 sheets were printed, and 1,814 compiled plans, tracings, graphs, &c., were prepared.

3. Photographic Records.

The total number of negatives now on record is 6,281, representing an addition of 1,795 negatives during the year while 10,125 prints, 175 lantern-slides, and twenty-eight enlargements were prepared during the period under review.

4. Educational Publications and other Literature printed during the Year.

1,000 copies Leaflet No. 7 : " Commercial Forestation."
1,000 copies Circular No. 22A : " Forestry in New Zealand."
2,000 copies Bulletin No. 4 : " Beech Forests, Part II."
1,000 copies Circular No. 26 : " Prevention of Sap-stain in White-pine."

5. Reference Library.

The central library continues to render very good service as a source of reference on all forestry matters and the many kindred subjects associated therewith, and by a system of exchange with other Forest Services and the acquisition of new works from time to time has been kept thoroughly representative and up to date in respect to all literature concerning the latest developments in forestry practice and technique throughout the world.

During the past year the library was further strengthened by the addition of 369 new books, pamphlets, reports, &c., amongst which may be mentioned : Simmonds—" Eucalypts " ; Tillyard—" Insects of Australia and New Zealand " ; Cowan—" Tongariro National Park " ; Sudworth—" Check-list of Forest-trees of United States of America " ; Somerville—" How a Tree grows."

During office hours the library is open to the general public for inspection or reference purposes.

APPENDICES.

APPENDIX I.

State and Provisional State Forest and Forest Reserves.

Areas in Acres at End of Fiscal Year, 1928.

Land District.	Area in Acres at End of Fiscal Year 1926-27.			Changes in Area during the Fiscal Year 1927-28: Net Increase in Acres.			Area in Acres at End of Fiscal Year 1927.			Percentage of Area of Land District in Permanent and Provisional State Forest and Forest Reserves.
	State Forest.	Provisional State Forest.	Forest Reserves.	State Forest.	Provisional State Forest.	Forest Reserves.	State Forest.	Provisional State Forest.	Forest Reserves.	
N. Auckland	116,469	58,777	..	166*	1,672*	..	116,303	57,105	..	3·9
Auckland ..	305,526	488,708	2,316	74,646	1,770	..	380,172	490,478	2,316	10·2
Gisborne ..	87,696	209,524	11,160	..	136*	..	87,696	209,388	11,160	8·79
Hawke's Bay	113,637	1,500	5,254	..	..	..	113,637	1,500	5,254	4·14
Taranaki ..	69,757	46,178	40,455	..	3*	..	69,757	46,175	40,455	6.51
Wellington ..	457,092	114,902	14,007	4,004†	1,084*	..	461,096	113,818	14,007	8·75
Nelson ..	19,201	1,974,917	8,470	8,514	498	..	27,715	1,975,415	8,470	43·0
Marlborough	89,497	120,625	12,062	..	..	..	89,497	120,625	12,062	8·04
Westland ..	2,190	1,713,654	119	..	1,537*	..	2,190	1,712,117	119	44·5
Canterbury ..	329,059	..	319	365†	..	..	329,424	..	319	3·48
Otago ..	133,662	335,200	2,108	226	2,850*	..	133,888	332,350	2,108	5·24
Southland ..	137,427	605,376	..	930*	..	..	136,497	605,376	..	9·44
Totals ..	1,861,213	5,669,361	96,270	86,659†	5,014*	..	1,947,872	5,664,347	96,270	..
	(7,626,844)						7,708,489			

* Decrease. † Net Increase.

APPENDIX II.

Summarized Report upon State Afforestation in the Forest Conservation Regions of the Dominion.

AUCKLAND REGION.

Plantations and Nurseries.

Riverhead.—As a means of supplying the future timber-requirements of the City of Auckland and surrounding country, the establishment of the Riverhead Plantation was commenced last year (*vide* report for 1927), and good progress has been made. The area planted for the season (including trial espacements on 50 acres) is 2,615 acres, with approximately 1,807,100 trees. Two miles of new permanent roads were completed, 43½ miles of fire-breaks laid off, 15 miles of fire-breaks ploughed, and 2½ miles of interior roads regraded. One bridge was constructed, and the material secured for two others. A topographical survey of 6,220 acres was completed. In the nursery 1,430 lb. of seed were sown, 1,023,300 trees lifted for planting, 46,200 lined out, and 61,000 carried over as two-year-old seedlings. The stock of trees at the end of the year was 4,117,300. Further areas of land were acquired to round-off and thus safeguard this plantation unit from fire, &c., and negotiations are in progress for the purchase of other suitable sections to consolidate the area.

Puhipuhi.—Maintenance-work was carried out on existing fire-breaks and three miles of new internal breaks were laid off and cleared. The planting-up of 80 acres of the unsuccessful eucalypt plantation was accomplished, and 73,350 insignis pines were put out. The portion planted with two-year-old stock struck well, but in the remainder, where one-year seedlings were used, the dense bracken militated against a successful strike.

Waipoua.—A further area of 55 acres was planted with 32,800 trees, bringing the total so established to 141 acres. Included in this is an area of 25 acres of trial spacings with 12,600 trees.

Maramarua.—Early last year 14,431 acres of national-endowment land in the northern corner of Waikato County, lying midway between the Firth of Thames on the east and the Main Trunk and the Waikato River to the west, were proclaimed a State forest, with the object of forming a plantation to meet the future needs of the settlers from the sparsely forested Hauraki Plains and Waikato district. The block is well situated for the purpose and has access by good metalled roads. The preliminary work preparatory to planting carried out during the year included the laying-off of thirty-four miles of fire-breaks, formation of many miles of wagon and sledge tracks, and the erection of 30 chains of fencing round the proposed headquarters site. No planting was done, but 100 acres were experimentally direct sown.

Objectives for 1928–29.

1. Raising 4,500,000 trees.
2. Establishing a nursery at Maramarua.
3. Establishing 4,278 acres of new plantation.
4. Establishing 1,000 acres by direct sowing.
5. Completion of topographical survey at Riverhead.
6. Laying-out of fire-breaks, tracks, roads, &c., for 1928–29 planting-areas.

ROTORUA REGION.

Tree-raising.

When consideration is given to the exceptionally dry summer, the true crop both at Rotorua and Wairapakao Nurseries must be regarded as quite satisfactory. A sowing of 5,019 lb. of seed was made which resulted in a crop of approximately 30,861,000 seedlings, and this, together with the lined-out and two-year-old seed-bed stock, increased the total available nursery stock to 34,988,500 trees.

The line-sown crop has again given excellent results; damping-off was practically nil, and the very high strike of 10,970 plants per pound was obtained. Insignis pine composed the bulk of this crop, and the remainder Corsican and prickly-cone pine also showed splendid results. Trayed stock again did exceptionally well, and from this source 107,000 *Cupressus macrocarpa* and 189,000 eucalypt plants of excellent quality will be available for sale.

Tree-planting and Direct Sowing.

Last year's objective for the new season—the establishment of 15,000 acres of new plantations—was more than realized, as the season closed with the record planting of 12,889,730 trees on 22,768 acres, while 161,500 trees were absorbed in blanking. In addition, 2,345 acres of new plantation were formed by direct seeding, making in all a grand total of 25,113 acres. The survivals on the planted areas have been, generally speaking, very good, averaging approximately 83 per cent., while in direct seeding varying success has been obtained, germination counts showing from five hundred to two thousand seedlings per acre.

Although exceptionally wet weather was experienced during the major part of the planting season, conditions, on the whole, were favourable, with the exception of the hot dry weather which prevailed towards the latter end of the period, and which necessarily curtailed planting operations somewhat and was responsible for certain losses.

Labour planting-costs were reduced to the very low figure of 8s. 5d. per acre, a very appreciable reduction of 23 per cent. over similar costs last year. To the greatly increased size of the planting-area this substantial reduction is due to a large extent.

Thinning.

The area thinned to date is 995 acres, distributed as follows: Waiotapu Plantation—Larch, 448 acres; pines, 228 acres; other species, 4 acres. Whakarewarewa Plantation—Larch, 216 acres; pines, 18 acres; eucalypts, 81 acres. At Waiotapu 10 acres were underscrubbed preparatory to thinning.

Tree and Seed Sales.

Sales to farmers, local bodies, afforestation companies, and transfers to other regions accounted for 3,226,372 trees.

The sale of tree-seed amounted to 2,045 lb.

Arboretum.

Fencing this area was completed, and good progress made with the internal layout of roads and blocks.

Fire Protection.

An unusually dry summer caused a high fire hazard throughout the plantations, and it was necessary to meet the situation by doubling the fire-patrol personnel and extending the working-hours at certain points where the fire risk was most dangerous. In spite of these adverse conditions, and although several fires occurred close to the plantations, no damage was done or loss sustained. During the year thirty-two fully-equipped fire-fighting tool-depots were placed in the plantations.

Equipment.

One 2-ton caterpillar tractor and a 1-ton Ford truck were added to the equipment at Kaingaroa, and a single-wheel Gravely garden tractor to the Rotorua Nursery equipment. The machine first mentioned has been of great benefit in carrying out the heavy roading and fire-break-formation work, but the Gravely machine has been of only limited utility.

Objectives for 1928–29.

1. To establish 30,000 acres of new plantations—20,000 acres by direct planting and the balance by direct seeding.
2. To raise 25,000,000 trees.
3. To increase sales of trees and seeds.
4. To further develop an improved technique in seed-bed and direct-sowing methods.
5. To extend fire districts and increase fire-fighting depots.
6. To topographically survey and lay out planting areas for 1929–30 season.
7. To construct fifty-two miles of roads and improve and extend existing telephone system.
8. To carry out further experimental planting at Kaingaroa—(*a*) With mixtures of conifers and broad-leaf species; (*b*) with varying espacements; (*c*) spot-seeding.
9. To secure more and heavier motor equipment.
10. To secure a water-boring plant.

WELLINGTON REGION.

Karioi Plantation.

Good progress was made on this new project, and it is pleasing to record that 1,306 acres were planted with 906,200 trees, 6 acres in excess of the objective aimed at when the year commenced. Labour costs amounted to 8s. 10d. per acre.

Drill-sowing.

A good seed-drill was purchased, and with certain mechanical alterations it rendered good service. By this method 155 acres were sown on Tangiwai Block at a cost of 5s. 10d. per acre with 6·6 oz. of seed per acre.

Spot-sowing.

An area of 18 acres which was too rough for drill sowing was spot-sown with an espacement of 8 ft. at a cost of 7s. 11d. per acre.

Nursery.

Sixteen acres, with a sowing of 1,016 lb. of seed, were put down, and the estimated crop is 4,231,600 trees. Trees lined out for two-year-old stock numbered 240,000. Seed-bed results were not entirely satisfactory, partly owing to the dry season and lack of covering. Weeding was kept well in hand.

Buildings.

The buildings on the property were reconditioned and painted. One cottage and four huts were purchased and altered where necessary. The huts have been removed to No. 1 planting camp. The cookhouse was improved and lighted with acetylene gas.

Sand-dune Reclamations.

A detailed report on the experimental work carried out on the sand-dunes at the mouth of the Rangitikei River is given in an earlier portion of this report.

NELSON-MARLBOROUGH REGION.

Golden Downs Plantation.

Planting was commenced on this new afforestation project, and an area of 494 acres established with 335,920 trees. To enable locally-grown tree stock to be used for subsequent planting, 7 acres were laid out as a nursery and sown with 687 lb. of seed, from which approximately 4,263,800 seedlings have been raised.

Dumgree Plantation.

Ten acres were blanked with two-year-old insignis pine. The nursery at the close of the year held 507,500 trees, of which 195,000 were transferred to Golden Downs and 55,000 were sold locally.

Seed-collection.

The seed collected locally amounted to 526 lb., made up as follows: *Pinus radiata*, 110 lb.; *P. canariensis*, 176 lb.; *Pseudotsuga Douglasii*, 30 lb.; *Sequoia sempervirens*, 210 lb.

Sample Plots.

Four sample plots were laid out and measured at Dumgree Plantation, and figures from these were collected for the compilation of local yield tables.

Proposals for 1928–29.

1. Establishing 3,000 acres of new plantation at Golden Downs.
2. Raising 7,500,000 trees.
3. Demarcating roads and reopening tracks, &c., in provisional State forests.

CANTERBURY–OTAGO REGION.

Nurseries.

The total tree stocks in the nurseries have eclipsed all previous records with a grand total of 23,875,650 showing the remarkable increase of over five million more than last year.

Detailed figures are as follows:—

Station.	One-year.	Two-year.	Three-year.	Total.
Balmoral and Hanmer	5,731,000	5,627,620	51,230	11,409,850
Tapanui	6,453,050	3,799,350	105,800	10,358,200
Naseby	859,900	1,241,000	6,700	2,107,600
Grand total	..	..	..	23,875,650

At Tapanui, although indifferent weather was experienced, the raising of planting stock was signally successful, with the exception of eucalypts, which suffered very severely from heavy frosts. It is interesting to note that experience over a period of years conclusively proves that at Tapanui soil and climatic conditions are much better suited to raising a finer class of tree than at Hanmer Nursery. Owing to the difficulty in growing eucalypts, their liability to attack by numerous pests, and costs of transportation, these species, with a few exceptions, are unsuitable for general planting in Otago and Southland. *E. Gunii* has proved a useful tree. Several other species grow well in Nelson, where attacks by disease are not so frequent.

The main nursery for North Canterbury established at Balmoral last year has produced excellent results, and the change of major operations from Hanmer Springs has been amply justified. At the latter station the soil is heavier, weed-growth more rapid, and losses from frost lift much greater than at the former.

The trees lined out number 375,900, and are looking well. It is estimated that approximately 11,247,000 trees will be available for sale and transfer to the various afforestation stations.

Seed sown totalled 3,304 lb., or 148 lb. more than last year, and most satisfactory results were obtained.

Tree-planting.

Last year's objective of 7,000 acres of new forests was more than realized, and 7,159 acres were actually established. This is considered a very satisfactory performance when it is borne in mind that the planting gangs were largely recruited from the ranks of the unemployed and comprised workmen unused to this class of work.

Direct sowing at Spec Gully, Naseby, met with disappointing results owing to the excessive moisture in the soil rotting the seed.

The death-rates at Hanmer and Balmoral were respectively 11 per cent. and 29 per cent., and at Blue Mountains 10 per cent. The losses at Balmoral are attributed to the very dry weather in January and February.

School Forestry.

Excellent co-operation has been given by the Education Department in connection with the scheme for affording the children of the primary schools an opportunity to acquire an elementary knowledge of tree-planting and forestry matters generally, and a series of articles on various aspects of forestry will appear from time to time in the *School Journal*.

Proposals for 1928–29.

1. The establishment of 8,550 acres of new forests, of which 350 acres will be by direct sowing.
2. A reconnaissance survey of the indigenous forested land surrounding the headwaters of the Hope Hurunui and Waiau Rivers.

WESTLAND REGION.

Nursery.

The nursery is now on a sound working-basis, and 528,800 trees were raised during the period under review from 329 lb. of seed at a cost of 15s. per 1,000. Weeding is still the heaviest cost, and from November till the middle of January constant attention is necessary to combat this nuisance. The best results were obtained from September sowing, but owing to the uncertain climatic conditions this may not hold good next season, as in 1926–27 late August sowing was the best.

Experiments with green-manuring, lupins, oats, tares, and mustard-seed have greatly improved soil conditions, the lupin crop giving best results.

Experiment Station.

With various species of exotic trees experimental planting was continued, and on 400 acres 257,500 trees were established at a much lower cost than in previous years. The reduction is accounted for by the employment of more experienced workmen on dry easily-worked ground. Blanking on 200 acres was necessary, and 102,400 trees were utilized for the work. A record dry summer was experienced, with a dangerous fire risk, and in spite of unceasing diligence a fire reached portion of the plantation, but fortunately was extinguished with little damage. It is anticipated that some 20 acres of dredge tailings will be available for planting next year. The 1926–27 planting of *Pinus laricio* and *Pinus ponderosa* is growing slowly, while the Douglas fir is making good growth. It is as yet somewhat early to judge the ultimate result of this experimental planting.

Arboretum.

A 3-acre portion of the new arboretum area was planted with fourteen species of trees. A good strike resulted.

Proposals for 1928–29.

1. Establishment of new shelter-breaks.
3. Planting 2 acres of arboretum area.
3. Planting 200 acres new area and reblocking previous year's planting.
4. Line-cutting 500 acres.
5. Establishment of new fire-breaks.

SOUTHLAND REGION.

Although as yet no definite area has been set aside in this region as a forestation project, 124 acres of cut-over land in Longwood State Forest were planted with 68,900 trees, comprising six species. Planting-work was undertaken in August and completed in September. A small wooden hut, 10 ft. by 14 ft., was erected for a control and tool depot. Further experimental planting by spot-sowing on a total area of 50 acres of cut-over and burned-over land in Waikaia and Longwood was carried out.

Sample Plots.

The various sample plots sown in September, 1927, were inspected six months later, and results carefully recorded for future use. So far the strike generally has been very satisfactory.

APPENDIX III.

Summary of Operations in Nurseries.

Name of Nursery.	Type of Nursery.	Year of Establishment.	During Year ended 31st March, 1928.								From 1896 to 1928.		
			Total Expenditure.				Trees in Nurseries.				Trees in Nurseries.		
			Tree-growing.	Maintenance.	Buildings, &c.	Total.	Estimated number of Trees raised during Year.	Output of Trees.		Number of Trees estimated in Nursery at 31st March, 1928.	Estimated Number of Trees raised during Period.	Output of Trees.	
								Number of Trees sent to Plantation during Year.	Number of Trees sent to Outside Places during Year.			Number to Plantations.	Number to Outside Places.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.							
Rotorua ..	Distributing ..	1898	8,379 3 7	1,411 9 3	162 5 9	9,952 18 7	19,353,000	5,765,730	3,233,470	22,695,700	154,251,444	98,826,384	19,082,120
Hanmer Springs	,, ..	1902	3,990 14 5	1,712 18 3	79 19 2	5,783 11 10	5,630,550	2,629,380	169,661	10,725,300	37,955,378	21,327,195	2,322,304
Tapanui ..	,, ..	1897	3,287 6 11	1,668 14 10	70 0 7	5,026 2 4	6,453,050	530,185	234,562	10,358,200	35,971,757	21,539,753	3,371,401
Naseby ..	,, ..	1921	574 18 1	118 6 3	6 9 10	699 14 2	859,900	43,895	117,565	2,107,600	3,924,106	928,385	320,781
Riverhead ..	Forest and Ranger	1926	1,241 14 3	262 1 10	422 7 8	1,926 3 9	4,065,150	1,823,357	..	4,117,320	5,957,050	1,823,357	..
Kaingaroa ..	Ditto ..	1927	2,374 11 0	189 18 11	585 9 7	3,149 19 6	11,512,000	6,320,500	..	12,287,520	11,512,000	6,320,500	..
Golden Downs	,, ..	1927	107 15 4	707 0 0	50 8 0	865 3 4	4,263,846	Nil	..	4,263,846	4,263,846	Nil	..
Tangimoana ..	,, ..	1921	..	..	..	..	650,000	,,	..	..	1,122,765	..	..
Westland ..	,, ..	1922	1,184 11 10	687 5 5	140 4 6	2,012 1 9	527,470	360,000	..	1,027,331	2,068,794	649,489	..
Waipoua ..	,, ..	1925	..	..	..	..	13,600	25,000	..	18,296	109,289	84,785	..
Puhipuhi ..	,, ..	1925	..	..	..	..	90,350	73,350	..	..	199,600	..	..
Dumgree ..	,, ..	1924	..	..	..	..	60,000	192,000	55,000	100,000	701,000	302,000	55,000
Ranfurly ..	Closed 1922 ..	1896	..	..	..	..	..	..	..	..	6,975,451	6,465,593	509,858
Starborough ..	,, 1908 ..	1901	..	..	..	..	..	..	..	..	3,059,610	1,965,095	1,094,515
Kurow ..	,, 1908 ..	1906	..	..	..	..	..	..	..	..	172,460	..	172,460
Totals ..	..	..	21,140 15 5	6,757 14 9	1,517 5 1	29,415 15 3	53,478,916	17,763,397	3,810,258	67,701,113	268,244,550	160,232,536	26,928,439

APPENDIX III—*continued.*

SUMMARY OF OPERATIONS IN PLANTATIONS.

Name of Plantation: (*a*) Under formation; (*b*) On Maintenance Basis.	Year of Establishment.	During the Year ended 31st March, 1928.					From Year of Establishment to 1928.			
		Number of Trees planted on New Area.	Number of Trees used to replace Losses.	New Areas planted.	New Area of Direct Formation.	Total Expenditure for the Year, including Cost of Trees from Nurseries.	Number of Trees received from Local Nurseries.	Number of Trees used to replace Losses.	Total Areas planted.	Total Establishment Cost to date, including Cost of Trees from Nursery, but not Cost of Land.
				Acres.		£ s. d.			Acres.	£ s. d.
(*a*) Riverhead	1926	1,807,149	..	2,615	100	12,065 11 4	1,849,649	..	2,668	13,341 8 7
(*a*) Kaingaroa	1913	12,889,730	161,500	22,768	2,345	33,466 10 2	60,334,045	3,407,285	75,503‡	228,669 12 11
(*a*) Karioi	1927	906,205	..	1,306	173	8,471 1 1	..	..	1,306	8,471 1 1
(*a*) Golden Downs	1927	335,920	..	494	..	2,916 9 8	..	..	494	2,916 9 8
(*a*) Hanmer Springs	1901	567,725	221,100	779	..	9,740 8 0	13,143,378	2,141,799	7,900	88,139 16 1
(*a*) Balmoral	1916	3,638,716	205,150	5,358	..	16,931 0 2	10,778,128	987,710	13,016	79,592 7 7
(*a*) Blue Mountains	1925	692,635	..	988	..	10,973 7 2	2,441,035	131,500	3,256	25,067 4 9
(*b*) Puhipuhi	1904	..	73,350	..	..	676 8 0	1,575,050	575,050	1,200	14,624 13 5
(*b*) Whakarewarewa	1898	..	..	..	..	4,353 7 4	20,626,050	3,999,464	8,037	134,666 7 6
(*b*) Waiotapu	1901	..	..	..	..	3,513 16 7	23,529,152	4,883,134	7,010	111,156 12 3
(*b*) Naseby	1900	..	4,245	..	..	1,519 18 3	6,040,293	1,041,275	2,366	52,034 14 6
(*b*) Conical Hills	1903	..	..	..	..	1,636 3 3	10,762,701	1,476,405	3,533	79,152 6 11
(*b*) Pukerau	1915	..	..	..	..	..	906,685	86,688	573	..
(*b*) Dusky Hill	1898	..	..	..	..	..	3,061,997	881,160	746	†
(*b*) Raincliff	1889*	..	..	..	..	66 14 5	..	..	206	535 15 0
(*b*) Greenvale	1917	..	62,200	..	..	3,033 0 1	4,562,770	550,880	3,646	83,248 2 6
Experimental Group.										
(*a*) Waipoua	1924	31,535	1,286	55	..	289 1 7	91,510	1,286	141	454 5 5
(*a*) Tangimoana	1921	150,590	14,310	219	..	2,316 3 1	144,990	25,810	534	4,088 12 4
(*a*) Westland	1922	257,525	102,475	400	..	3,089 19 4	649,489	107,475	1,288	14,017 7 10
(*a*) Longwood	1927	68,905	..	124	48	383 16 2	..	..	124	383 16 2
(*b*) Dumgree	1903	..	6,800	..	..	343 19 0	1,794,265	1,157,450	342	15,323 4 2
(*b*) Tasman West	1925	..	..	..	..	..	1,750	127	5	17 0 0
(*b*) Gimmerburn	1903	..	..	..	..	2 0 5	936,235	783,339	88	6,909 0 6
(*b*) Waitahuna	1906	..	..	..	..	..	42,025	11,500	11	330 7 9
(*b*) Galloway	1915	..	..	..	..	..	6,930	3,050	2	84 19 10
(*b*) Omarama	1915	..	..	..	..	0 9 0	4,390	..	2	81 1 9
Totals	..	21,346,635	852,416	35,106	2,666	115,789 4 1	63,282,517	22,252,387	133,997	963,306 8 6

* Established privately and purchased in 1901. † Expenditure included in Greenvale. ‡ Does not include 4,753 acres of direct formation.

APPENDIX IV.

Exports and Imports of Sawn Timber and other Forest Products.

Exports.

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1926–27.)

Item	1925.		1926.		1927.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ft. b.m.	£	Ft. b.m.	£	Ft. b.m.	£
Totals	51,549,439	605,187	41,953,879	490,247	37,180,548	425,928
Kauri	3,238,693	63,624	1,987,046	46,320	2,476,222	57,089
Rimu	3,709,934	32,757	4,008,370	35,839	3,841,366	36,184
White-pine	39,748,206	446,298	31,767,504	356,856	27,802,036	289,981
Beech	2,221,293	28,474	2,392,734	33,098	2,580,604	37,330
Others (New Zealand) ..	1,318,060	16,698	309,557	3,514	462,835	4,869
Others (foreign)	1,313,253	17,336	1,488,668	14,620	17,485	475
	Tons.	£	Tons.	£	Tons.	£
Tanning-bark	59	978	99	1,129	38	652
Kauri-gum	5,370	414,901	4,877	332,765	4,674	298,632
Fungus	93	10,547	87	11,246	141	20,310

Imports.

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1925–27.)

Item.	1925.		1926.		1927.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ft. b.m.	£	Ft. b.m.	£	Ft. b.m.	£
Australian hardwoods ..	33,965,298	560,998	22,139,979	349,008	26,290,490	412,966
Douglas fir	17,115,606	125,710	16,821,122	119,717	17,638,401	125,683
Cedar	6,525,681	81,476	9,021,300	107,222	2,389,853	24,265
Other	24,317,199	410,798	18,521,471	250,475	15,449,248	221,805
Totals	81,923,784	1,178,982	66,503,872	826,422	61,767,992	784,719
	Number.	£	Number.	£	Number.	£
Laths, rails, pailings ..	9,937,671	15,962	14,279,895	26,689	10,156,414	15,424
	Tons.	£	Tons.	£	Tons.	£
Tanning-bark	2,310	28,229	2,250	23,240	865	12,352
Wood-pulp	2,035	27,754	2,710	35,883	3,156	38,467

APPENDIX V.

State Forests Account.

Comparative Analysis of Receipts and Payments from 1st April, 1919, to 31st March, 1928.

	1919–20.		1920–21.		1921–22.		1922–23.		1923–24.		1924–25.		1925–26.		1926–27.		1927–28.		Total.		Grand Total.
	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	Capital.	Operation.	
Receipts—	£		£		£		£		£		£		£		£		£		£		£
Forest income	8,514		19,518		30,784		63,372		93,480		161,469		152,550		128,566		115,398		773,651		..
Loans raised	65,000		70,000		86,780		214,221		209		100,000		..		..		160,000		696,210		..
Total receipts ..	73,514		89,518		117,564		277,593		93,689		261,469		152,550		128,566		275,398		1,469,861		..
Payments—	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Salaries	7,111	1,937	10,823	6,772	10,400	20,794	8,626	21,475	9,272	21,414	9,035	22,394	11,103	25,912	17,075	22,783	16,476	27,194	99,921	170,675	270,596
Development and management of indigenous State forests	222	3,722	4,191	7,575	5,251	12,301	1,563	12,227	2,177	14,094	2,792	14,670	3,082	15,500	4,204	17,839	3,474	15,840	26,956	113,768	140,724
Forest-fire protection	..	..	..	..	72	963	95	1,712	81	1,896	125	1,405	38	1,553	73	1,524	182	3,166	666	12,219	12,885
Educational	..	188	..	..	369	479	191	383	119	463	100	819	213	1,164	107	1,094	180	472	1,279	5,062	6,341
Forest research	..	..	..	223	..	999	1,135	1,089	2,142	1,496	1,750	2,847	3,615	2,158	2,402	2,472	2,059	5,181	13,103	16,465	29,568
Afforestation and forest-extension	46,072	..	49,631	..	43,792	..	30,814	..	37,320	..	50,182	..	63,910	..	80,730	..	110,842	..	513,293	..	513,293
Lands purchased for afforestation	145	..	157	..	2,128	..	3,585	..	..	..	476	..	17,764	..	11,181	..	18,352	..	53,788	..	53,788
Forested lands purchased ..	7,294	..	..	..	7,173	..	1,064	..	4,474	..	105,993	..	16,161	..	18,639	..	830	..	161,628	..	161,628
Local-body allocations and grants, &c.	..	100	..	..	258	1,152	..	929	..	2,570	..	790	..	6,215	..	9,805	..	7,241	258	28,802	29,060
Advice, assistance, and preparation of planting-plans for local bodies and settlers	..	28	..	..	..	1,399	..	757	..	686	..	1,196	..	1,358	..	1,611	..	2,918	..	9,953	9,953
Net interest and loan charges ..	..	3,577	..	6,127	397	9,797	4,818	17,155	913	17,337	893	16,516	..	20,954	..	24,525	..	33,816	7,021	149,804	156,825
National Endowment Account, transfers to	..	..	..	..	..	..	..	..	..	..	..	12,612	..	9,741	..	15,659	..	13,885	..	51,897	51,897
Total payments ..	60,844	9,552	64,802	20,697	69,840	47,884	51,891	55,727	56,498	59,956	171,346	73,249	115,886	84,555	134,411	97,312	152,395	109,713	877,913	558,645	1,436,558
Grand total payments	70,396		85,499		117,724		107,618		116,454		244,595		200,441		231,723		262,108		1,436,558		

APPENDIX VI.

STATE FORESTS ACCOUNT.

Receipts and Payments Account for the Year ended 31st March, 1928.

Receipts.

	£ s. d.	£ s. d.	£ s. d.
To Cash in hand, 1st April, 1927—			
In Post Office	..	6,104 0 8	
In Public Account	1,994 1 1		
In Investment Account	15,000 0 0		
Imprests outstanding in London.. ..	1,480 0 0		
Imprests outstanding in the Dominion ..	166 1 8		
		18,640 2 9	
			24,744 3 5
Interest on securities held by investment Account	..	..	1,224 4 5
Finance Act, 1927, section 3 (1) Advance from Consolidated Funds	..	45,000 0 0	
Inscribed stock issued	..	115,000 0 0	
Temporary transfers from other accounts ..	..	50,000 0 0	
			210,000 0 0
Receipts—Indigenous forests—			
Timber-sales	75,755 15 11		
Timber royalties	5,273 16 10		
Timber trespass	354 3 0		
Leases—Grazing	3,110 0 10		
Leases—Sawmill-sites, &c.	800 12 5		
Leases—Industrial	1,044 11 10		
License and transfer fees	120 16 8		
Miscellaneous licenses	102 2 0		
Permits—Grazing	142 12 9		
Permits—Miscellaneous	190 11 9		
Kauri-gum	132 7 2		
Fees for inspections and reports ..	702 16 8		
Interest on overdue promissory notes ..	135 5 1		
Rental of houses	80 0 0		
Opossum revenue	4,097 18 0		
Akatarawa Reserve—Revenue	..		
Miscellaneous	2,208 19 8		
		94,252 10 7	
Receipts — National - endowment indigenous forests (allocation in terms of section 39, Forests Act, 1921–22)		9,897 14 5	
Carried forward		104,150 5 0	235,968 7 10

Payments.

	£ s. d.	£ s. d.	£ s. d.
By Permanent charges—			
Recoupment of management charges of consolidated stock		127 8 11	
Recoupment of stamp duty on transfers on New Zealand consolidated stock, 1935–45		68 14 11	
Recoupment of charges and expenses of raising loans		575 0 0	
			771 3 10
Interest on advances from Consolidated Fund		3,999 7 6	
Interest on loans recouped to Consolidated Fund		28,714 10 6	
Interest on temporary transfers from other Accounts		1,554 16 0	
			34,268 14 0
Temporary advances from other accounts repaid		..	50,000 0 0
Transfer to National Endowment Account ..		..	13,884 15 9
Transfer to Electric Supply Account		..	22 3 0
Capital charges—			
Sub. II.—General development of State forests—			
Buildings	452 12 8		
Motor-vehicles, field, and office equipment	1,550 1 4		
Forest Atlas	379 4 7		
Roads, tracks, and telephone-lines ..	428 19 1		
Demarcation	424 19 5		
Salaries (includes pay of non-permanents)	428 2 11		
Re-establishment of Longwood Forest ..	250 0 10		
		3,914 0 10	
Sub. III—Forest-fire prevention—			
Equipment	182 8 9		
Salaries	..		
		182 8 9	
Sub. IV.—Educational—			
Reference library	170 9 10		
Photographic equipment	9 1 9		
Salaries	1 3 7		
		180 15 2	
Sub. V.—Forest research—			
Arboretum, Rotorua	125 10 5		
Forest Experimental Station, Westland	1,708 15 9		
Timber-testing equipment, &c. ..	19 17 2		
Salaries	188 6 6		
Forest experimental station, Auckland ..	204 18 4		
		2,247 8 2	
Carried forward	..	6,524 12 11	98,946 16 7

APPENDIX VI—*continued.*

STATE FORESTS ACCOUNT—*continued.*

Receipts and Payments Account for the Year ended 31st March, 1928—continued.

Receipts—continued.

	£ s. d.	£ s. d.	£ s. d.
Brought forward		104,150 5 0	235,968 7 10
To Receipts—Nurseries and plantations—			
Trees	7,961 0 9		
Seeds	1,666 14 11		
Firewood and poles	275 12 4		
Grazing	438 6 0		
Rental of houses	878 18 9		
Miscellaneous	299 10 11		
		11,520 3 8	
			115,670 8 8
Recoveries of expenditure and credits-in-aid—			
Sub. I.—Salaries	..	42 16 2	
Sub. II.—General development of State forests—			
Capital charges—			
Sales of motor-vehicles, equipment, &c.	12 2 6		
Maintenance charges—			
Destruction of wild pigs, &c. ..	511 18 7		
Timber-cruising, &c.	526 5 6		
Travelling-expenses	30 14 3		
Sundries	176 13 4		
		1,257 14 2	
Sub. IV.—Educational—			
Capital charges—			
Reference library	..		
Maintenance charges—			
Department bulletins	26 4 0		
Sundries	1 11 2		
		27 15 2	
Sub. V.—Forest research—			
Maintenance charges—			
Timber-products testing, and travelling-expenses	2 7 6		
		2 7 6	
Sub. VI.—General afforestation—			
Capital charges—			
Nurseries and plantations	112 14 10		
Maintenance charges—			
Tree-seed operations, &c.	158 6 0		
		271 0 10	
			1,601 13 10
Carried forward	..	..	353,240 10 4

Payments—continued.

	£ s. d.	£ s. d.	£ s. d.
Brought forward	..	6,524 12 11	98,946 16 7
By Permanent charges—*continued*			
Capital charges—*continued.*			
Sub. VI.—General Afforestation—			
Nurseries and plantations, planting, &c.	108,674 16 9		
Salaries—Afforestation (includes pay of non-permanents)	15,858 12 3		
Land for extension of nurseries and plantations	18,352 4 6		
Sand-dune reclamation	1,971 0 9		
		144,856 14 3	
Sub. VII. — Acquisition of indigenous forests — Purchase of Puketitiri Block and other lands	..	830 1 0	
			152,211 8 2
Operation and Maintenance charges—			
Salaries	27,236 10 3		
Contribution to Public Service Superannuation Fund	670 3 5		
		27,906 13 8	
Sub. II.—General development of State forests—			
Postages, cables, &c., printing and stationery	1,828 5 1		
Payments to other Departments for services rendered	285 10 5		
Forest and grazing reconnaissance, timber cruising and appraisal, policing patrol, and maintenance permanent equipment	4,336 10 7		
Grant to officer on retirement, &c. ..	13 0 0		
Destruction of wild pigs, &c.	888 14 4		
Legal expenses, contingencies, &c. ..	224 5 7		
Office rent, heating, and lighting ..	3,605 1 2		
Transportation expenses and upkeep of motor-vehicles	1,581 17 6		
Travelling-expenses and transfer of officers	3,663 10 1		
		16,426 14 9	
Sub. III.—Forest-fire prevention—			
Communication and locomotion expenses, &c.	442 4 6		
Wages, &c.	2,724 6 4		
		3,166 10 10	
Carried forward	..	47,499 19 3	251,158 4 9

APPENDIX VI—*continued.*

STATE FORESTS ACCOUNT—*continued.*

Receipts and Payments Account for the Year ended 31st March, 1928—continued.

Receipts—continued.

	£ s. d.	£ s. d.	£ s. d.
Brought forward	..	..	353,240 10 4
To Contributions received from local authorities in respect of the administration expenses of the Akatarawa Reserve—			
Wellington City Council	9 4 7		
Lower Hutt Borough Council	0 12 8		
Petone Borough Council	0 16 6		
Hutt County Council	0 8 2		
Eastbourne Borough Council	0 3 3		
		11 5 2	
Contributions received from local authorities in respect of the purchase of the Akatarawa Reserve—			11 5 2
			£353,251 15 6

Payments—continued.

	£ s. d.	£ s. d.	£ s. d.
Brought forward	..	47,499 19 3	251,158 4 9
By Permanent charges—*continued.*			
Sub. IV.—Educational—			
Forest exhibits	29 18 3		
Photographic records, &c.	163 15 11		
Departmental bulletins and professional publications	290 10 4		
Travelling-expenses	15 14 10		
		499 19 4	
Sub. V.—Forest Research—			
Forest ecology	275 9 0		
Silvicultural management studies ..	412 19 11		
Utilization and timber-testing and travelling-expenses	4,245 3 4		
Forest entomology	249 8 5		
		5,183 0 8	
Sub. VI.—General afforestation—			
Preparation of planting-plans and forest-extension	239 8 5		
Tree-seed collection	1,670 14 8		
Travelling allowances and expenses ..	1,166 0 0		
		3,076 3 1	
Sub VII.—Acquisition of indigenous forests—			
Yearly rent, Otanewainuku S.D. ..	..	74 0 0	
Sub. VIII.—Grants and subsidies—			
Payments to local authorities, &c. ..	6,982 17 2		
Expenses of Forest Officers going overseas, &c.	184 8 1		
		7,167 5 3	
			63,500 7 7
Unauthorized expenditure	..	..	558 1 11
Cash balances at 31st March, 1928—			
In Post Office	..	250 19 1	
In Public Account	..	16,829 17 3	
Imprests outstanding in the Dominion ..	..	541 15 1	
Imprests outstanding in London	..	412 9 10	
Investment Account	..	20,000 0 0	
			38,035 1 3
			£353,251 15 6

NOTE.—The receipts include amounts received by the Post Office before the close of the financial year, but not paid into the Public Account until after the 31st March, 1928.

E. PHILLIPS TURNER, Director of Forestry.
W. TAYLOR, A.R.A.N.Z., Accountant.

I hereby certify that the statement of receipts and payments has been duly examined and compared with the relative books and documents submitted for audit, and correctly states the position as disclosed thereby.—G. F. C. CAMPBELL, Controller and Auditor-General.

APPENDIX VII.

Loan Account as at 31st March, 1928.

To Loan authority—	£	s.	d.	By Debentures issued—	£	s.	d.
Section 40, Forests Act, 1921–22*	500,000	0	0	Finance Act, 1916 (section 50), at 4½ per cent.	50,000	0	0
Section 40, Forests Act, 1921–22, and section 16, Finance Act, 1924	100,000	0	0	Finance Act, 1918 (No. 2), (section 32), at 4 per cent.	171,000	0	0
Section 8, New Zealand Loans Act, 1908 (charges and expenses of raising New Zealand consolidated stock, 1936–45)	4,396	13	5	Finance Act, 1918 (No. 2), (section 32), at 4½ per cent.	29,000	0	0
Section 40, Forests Act, 1921–22, and section 6, Finance Act, 1926	500,000	0	0	Finance Act, 1920 (section 16), at 4 per cent.	27,000	0	0
				Finance Act, 1920 (section 16), at 4½ per cent.	8,000	0	0
				Forests Act, 1921–22, at 4½ per cent.	10,000	0	0
				Forests Act, 1921–22, and Finance Act, 1924, at 5 per cent.	100,000	0	0
				Stock issued—			
				New Zealand consolidated stock, 1936–51, at 6 per cent.	1,774	12	10
				New Zealand consolidated stock, 1936–45, at 5 per cent.	204,396	13	5
				New Zealand Inscribed Stock, at 5¼ per cent.	115,000	0	0
				Balance of authority	388,225	7	2
	£1,104,396	13	5		£1,104,396	13	5

* Section 40, Forests Act, 1921–22, confirmed the authorities previously issued under the Finance Acts, 1916, 1918, and 1920, and repealed all the authorities outstanding thereunder.

Note.—Under Section 21, Finance Act, 1926, certain appropriations out of the Consolidated Fund for afforestation purposes, totalling £59,250, become repayable to the Consolidated Fund, and bear interest at 4½ per cent. from 1st April, 1926, until repayment.

APPENDIX VIII.

State Forests Account, 1917–28.

Fiscal Year.	Receipts.				Payments.			
	Forest Income.	Loans raised.	Interest on Investments.	Total.	Capital.	Operation.	Interest on Loans.	Total.
	£	£	£	£	£	£	£	£
Balance, 31st March, 1917	..	..	..	2,530	..	..	..	..
1917–18	13,299	28,100	..	41,399	40,865	988	902	42,755
1918–19	7,529	36,900*	..	44,429	39,162	2,182	1,861	43,205
1919–20	8,514	65,000	..	73,514	60,844	5,975	3,577	70,396
1920–21	19,518	70,000	..	89,518	64,802	14,570	6,127	85,499
1921–22	30,784	86,780	..	117,564	69,840	38,087	9,797	117,724
1922–23	63,372	214,221	2,935	280,528	51,823	38,591	19,701	110,115
1923–24	93,480	209	6,013	99,702	54,323	43,077	23,172	120,572
1924–25	161,469	100,000	6,727	268,196	171,920†	56,245	23,157	251,322
1925–26	152,550	..	7,178	159,728	115,886	63,729	28,004	207,619
1926–27	128,566	..	4,552	133,118	134,411	72,787	29,077	236,275
1927–28	115,398	160,000	1,224	276,622	152,395	75,896	35,040	263,331
					Balance, 31st March, 1928 ..			38,035
				1,586,848				1,586,848

* Includes £10,000 from Consolidated Fund. † Includes £100,000 purchase of Selwyn Settlement forest.

Note.—Credits-in-aid and recoveries have been deducted from expenditure.

Approximate Cost of Paper.—Preparation, not given; printing (2,500 copies, including graphs and illustrations), £100.

By Authority: W. A. G. Skinner, Government Printer, Wellington.—1928.

Price 1s.]