SESSION II.

1918.

NEW ZEALAND.

DEPARTMENT OF LANDS AND SURVEY:

STATE FORESTRY.

REPORT FOR THE YEAR ENDED 31ST MARCH, 1918.

Presented to both Houses of the General Assembly by Command of His Excellency.

CONTENTS.

REPORT.

The UNDER-SECRETARY FOR LANDS to the COMMISSIONER OF STATE FORESTS.

SIR,— Department of Lands and Survey, Wellington, 25th July, 1918.

I have the honour to submit herewith the annual report of the Forestry Branch of this Department.

I have, &c.,

T. N. BRODRICK, Under-Secretary.

The Hon. Sir F. H. D. Bell, K.C.M.G., K.C.,
Commissioner of State Forests.

PART I.—STATE NURSERIES AND PLANTATIONS.

TREES RAISED AND AREA PLANTED.

DURING the year ended 31st March, 1918, 6,882,700 trees were raised at the four State nurseries, and during the same period 4,725,547 trees were sent to the various State plantations and 530,458 to outside places.

At the different plantations where planting was done a total new area of 2,653 acres was afforested. The total area planted to date since operations were started in 1896 is now 32,645 acres. The following table shows the area planted prior to the 1st April, 1909, and the area planted yearly since that date:—

—	Planted before 1st April, 1909.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.	1917–18.	Total Area.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
North Island ..	7,802	1,807	1,575	1,664	776	1,288	1,416	1,913	1,918	1,633	21,792
South Island ..	3,291	891	1,025	902	828	537	749	764	846	1,020	10,853
Total	11,093	2,698	2,600	2,566	1,604	1,825	2,165	2,677	2,764	2,653	32,645

PRISON LABOUR.

In the South Island prisoners are not employed on the plantations. At Rotorua the total value of the work done by prison labour was £2,522 15s. 2d., the average earning per man being £89 17s. 6d. The total value of the work done in the North Island by prisoners since 1900 is now £47,008 12s. 11d.

STATE ASSISTANCE TO FARMERS IN TREE-PLANTING.

Trees to the number of 487,560, valued at £949 10s. 9d., were sold to farmers. This was an increase of 176,593 over the trees sold in the previous year. The different articles that have at various times appeared in the *Journal of Agriculture* and the public Press have brought home to farmers the great value of farm plantations for the purposes of shelter, firewood, and farmers' timber requirements; and it is probable that in the future greater advantage will be taken of the scheme of State assistance in tree-planting by farmers.

SALE OF PLANTATION THINNINGS.

At the Rotorua station several inquiries were received for mine-props and firewood, but owing to the shortage of labour much business had to be refused. Poles, firewood, stakes, and battens to the value of £827 11s. were sold from this station. The total receipts from both North and South Island plantations for these items were £871 13s.

GRAZING STOCK ON FIRE-BREAKS.

The grazing of stock on the fire-breaks has again proved very advantageous both from the points of view of the saving of labour and revenue received as fees and from the sale of stock and wool. The old ewes were satisfactorily sold, and the flock replenished with a line of sound-mouthed ewes, which were bought at very reasonable prices.

RECEIPTS AND EXPENDITURE.

The amount appropriated last year for expenditure upon State-forestry operations was £42,197, and the expenditure amounted to £41,852, or £11,539 in excess of the expenditure of the previous year.

The increase in expenditure is partly accounted for by payment of the sum of £3,294 for the purchase of 6,589 acres comprising part of the Balmoral Estate, Canterbury, which has been set

aside for the purpose of afforestation. In addition £1,581, war bonuses to employees, was charged on the account, instead of on the Consolidated Fund as was done during the previous year. The additional cost of material, seeds, forage, manure, &c., and the extra cost incidental to the increased area in trees, the erection of huts for accommodation of workmen, have contributed largely towards the increase in expenditure.

It will be understood that as the area under plantations increases additional expenditure is also required for the purpose of supervision, fire-protection, maintenance, &c. But the present charges are incurred almost entirely in respect of planting operations. The work of definition of further forest areas to be added to the existing State forests, and the adoption of efficient scientific methods of preservation, protection, and working of our Native forests, should be undertaken energetically, and special appropriation is sought for the additional expenditure which must necessarily be incurred.

As the whole of the borrowing authority under section 50 of the Finance Act, 1916, has been drawn upon, it will be necessary to provide increased borrowing-powers to enable forestry operations to be continued. The royalties from State forest areas are quite inadequate to provide the necessary funds for this purpose; in fact, the total receipts from royalties are estimated to come to only £4,700 for this year.

STATE FORESTS ACCOUNT.

Receipts.	£ s. d.	£ s. d.
Balance brought forward at commencement of year		2,530 9 0
Rents, royalties, and fees from State forest reserves		10,536 13 1
Proceeds from nurseries and plantations—		
Thinnings, posts, &c.	871 13 0	
Trees and seeds sold to farmers	910 17 3	
Sales of sheep, wool, &c.	769 15 8	
Miscellaneous grazing fees	210 3 2	
		2,762 9 1
Debentures issued under section 50, Finance Act, 1916		28,100 0 0
		£43,929 11 2

Expenditure.	£ s. d.	£ s. d.
Salaries, wages, and supplies, &c., charged to nurseries and plantations	38,593 5 7	
Sundry expenses — Travelling-expenses, postages	689 12 2	
War bonus	1,581 2 9	
		40,864 0 6
Management expenses of State forests		987 13 1
New Zealand Loans Act, 1908 (printing debentures)		0 14 0
Interest, recouping the Consolidated Fund in respect of debentures issued		902 6 9
Balance at 31st March, 1918		1,174 16 10
		£43,929 11 2

DIMINISHED STAFF AND SHORTAGE OF LABOUR.

During the year several members of the permanent staff have either enlisted or have been called up in the ballot, with the consequence that the work of those that remained has been much increased. There has, in addition, been a shortage of labourers, so that operations have been carried on under very unfavourable circumstances; nevertheless the area that was planted was only 111 acres less than that of the previous year.

EMPLOYMENT OF DISCHARGED SOLDIERS.

It was thought that the open-air life that can be enjoyed would attract discharged soldiers to take up tree-planting, but so far few of those that have been engaged have remained more than a few weeks. It has now been decided to erect at their main camps buildings suitable for having their meals in, and to allow them the services of a cook, together with certain small articles of equipment, and it is hoped that with these improved conditions more soldiers will take up the healthy occupation of tree-planting.

SURVEYS AND PLANS OF PLANTATIONS.

Before starting the planting of an area that has been reserved for afforestation it is essential that a plan should be made showing all the tram-lines, road-lines, fire-lines, and the various compartments into which the area is to be divided; a plan showing the topography and particulars of the soil is required, and also a plan to show the different varieties, &c., of trees with which the land is to be stocked.

In the spring a surveyor was sent up to the newly acquired area at Balmoral, and after he had done all the necessary field-work plans were made for this plantation. Similar surveys and plans are now being made for Greenvale, Hanmer, and Kaingaroa Plantations.

BALANCE-SHEET FOR PLANTATIONS.

A new feature of this year's report is the balance-sheets that have been drawn up showing the true financial position with regard to the North Island plantations and nurseries. Similar balance-sheets are being prepared for the South Island plantations and nurseries, but as in the South there are several more stations there has not been sufficient time, with a depleted staff, to get them ready for this report. In criticisms in the public Press it has been made to appear that the plantations have cost £13 an acre to establish. This, however, is not the case: the actual cost of establishment has not exceeded £10 an acre. The £13 an acre seems to have been arrived at by dividing the total area planted into the total expenditure. This, of course, gives a wrong result, as a considerable proportion of the area is under trees that are between twelve and twenty years old; a proportion of the expenditure on permanent improvements must be borne by areas not yet planted; and, further, it must be remembered that the operations of the Forestry Branch after it was first formed, twenty-two years ago, were to a considerable extent experimental.

SUMMARIES.

Summary of Operations in Nurseries during Year ended 31st March, 1918.

Name of Nursery.	Total Expenditure.				Trees in Nurseries.			
	Tree-growing.	Maintenance.	Buildings, &c.	Total.	Estimated Trees raised during Year.	Output of Trees.		Estimated Number in Nurseries at 31st March, 1918.
						Trees sent to Plantations during Year.	Trees sent to Outside Places during Year.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.				
Rotorua	3,959 10 5	1,072 10 4	400 14 10	5,432 15 7	3,128,000	2,630,097	290,698	4,321,500
Tapanui	1,267 5 6	828 5 0	112 6 2	2,207 16 8	1,417,500	775,915	161,100	5,186,420
Ranfurly	893 11 11	395 11 2	179 5 11	1,468 9 0	866,000	553,728	34,160	1,967,700
Hanmer Springs	1,000 12 11	565 9 7	105 5 11	1,671 8 5	1,471,200	765,807	44,500	3,487,900
Totals	7,121 0 9	2,861 16 1	797 12 10	10,780 9 8	6,882,700	4,725,547	530,458	14,963,520

Summary of Operations in Nurseries from 1896 to 1918.

Name of Nursery.	Total Expenditure.				Estimated Number of Trees raised.	Output of Trees.	
	Tree-growing.	Maintenance.	Buildings, &c.	Total.		To Plantations.	To Outside Places.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.			
Rotorua	52,223 12 10	6,611 16 6	11,831 3 1	70,666 12 5	60,786,674	54,893,338	1,571,836
Tapanui	29,052 2 7	828 5 0	5,310 10 1	35,190 17 8	25,253,039	14,774,168	1,117,238
Ranfurly	15,736 13 2	395 11 2	3,382 11 4	19,514 15 8	8,316,037	5,300,538	390,407
Hanmer Springs	14,584 3 8	565 9 7	3,287 15 5	18,437 8 8	18,440,142	10,133,880	566,154
Starborough*	6,399 9 10	..	2,856 17 3	9,256 7 1	3,059,610	1,965,095	1,094,515
Kurow*	960 4 2	..	2,109 18 5	3,070 2 7	172,460	..	172,460
Totals	118,956 6 3	8,401 2 3	28,778 15 7	156,136 4 1	116,027,962	87,067,019	4,912,610

* Nursery now closed.

N.B.—Expenditure has not been allocated to "Maintenance" separately until the present financial year.

Summary of Operations in Plantations during Year ended 31st March, 1918.

Name of Plantation.	Trees.			Expenditure.					New Area planted.	Cost per Acre planted.	General Maintenance per Acre.
	Number received from Nursery.	Number used to replace Losses.	Number planted on New Area.	Establishing.	Maintenance.	Buildings, &c.	Expenditure upon Disposal of Timber and Products.	Total.			
				£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Acres.	£ s. d.	£ s. d.
Whakarewarewa ..	141,895	121,940	19,955	437 3 0	3,144 17 8	58 3 0	583 11 0	4,223 14 8	12	2 6 8	0 8 0
Waiotapu	582,787	167	582,620	2,242 4 0	1,384 3 11	820 4 0	857 19 4	5,304 11 3	538	4 3 4	0 3 7
Kaingaroa Plains ..	1,838,700	545,600	1,293,100	2,934 18 0	758 13 2	760 15 10	..	4,454 7 0	1,083	2 14 3	0 3 1
Puhipuhi	66,715	66,715	..	..	892 10 4	..	..	892 10 4	..	..	0 14 10
Conical Hills	64,500	10,000	54,500	89 8 0	479 15 8	518 12 6	..	1,087 16 2	25	3 11 6	0 2 9
Pukerau	117,695	12,300	105,395	188 4 9	339 0 1	9 17 0	..	537 1 10	112½	1 13 5	0 15 2
Dusky Hill	12,500	12,500	..	..	237 0 4	217 4 0	..	454 4 4	..	..	0 5 7
Greenvale	581,220	..	581,220	1,611 9 8	409 9 7	1,443 8 6	..	3,464 7 9	370	4 7 1	1 2 1
Waitahuna	..	..	..	..	9 1 10	..	..	9 1 10	..	..	0 16 5
Gimmerburn	..	..	..	..	210 12 0	55 18 0	..	266 10 0	..	..	1 4 4
Naseby	553,728	121,624	432,104	832 0 1	420 9 10	30 13 9	..	1,283 3 8	234	3 11 1	0 6 6
Hanmer Springs ..	115,965	115,965	..	364 12 10	437 7 11	7 1 5	42 7 2	851 9 4	..	..	0 2 10
Balmoral	649,842	..	649,842	1,560 0 11	349 10 2	3,518 17 8*	..	5,428 8 9	279	5 11 9	0 15 3
Tekapo	..	..	..	4 10 0	..	..	..	4 10 0	..	..	..
Galloway†	..	..	..	1 0 0	..	..	..	1 0 0	..	..	..
Omarama†	..	..	..	13 13 6	..	..	..	13 13 6	..	..	..
	4,725,547	1,006,811	3,718,736	10,279 4 9	9,072 12 6	7,440 15 8	1,483 17 6	28,276 10 5	2,653½	..	..

* Includes purchase price of land, £3,249 10s. † Experimental.

Summary of Operations in Plantations from 1896–1918.

Name of Plantation.	Trees.				Expenditure.												Total Area planted.	Average Cost per Acre planted.			Average Cost of Maintenance per Acre per Annum.		
	Number received from Nursery.	Number raised from Seed sown *in situ*.	Number used to replace Losses.	Total Number in Plantation.	Establishing.			Maintenance.			Buildings, &c.			Expenditure upon Disposal of Timber and Products.			Total.								
					£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	Acres.	£	s.	d.	£	s.	d.
Whakarewarewa ..	20,396,416	109,725	3,773,730	16,732,411	33,389	11	10	23,421	7	8	8,344	14	4	1,349	13	7	66,505	7	5	7,966	4	15	2	0	3	0
Waiotapu	24,080,272	83,121	4,866,134	19,297,259	29,505	8	2	15,308	12	8	8,321	4	1	1,486	1	8	54,621	6	7	7,704	4	10	0	0	2	1
Kaingaroa	9,682,928	..	1,400,375	8,282,553	10,450	3	11	2,435	6	8	5,814	1	10	..			18,699	12	5	4,922	2	11	6	0	1	5
Puhipuhi	3,020,764	..	2,020,764	1,000,000	4,210	11	11	7,373	14	9	1,376	5	9	..			12,960	12	5	1,200	4	7	0	0	8	9
Conical Hills	10,710,376	..	1,424,080	9,286,296	17,115	11	1	12,350	12	4	2,992	4	2	..			32,458	7	7	3,533½	4	16	10	..		
Pukerau	780,860	..	12,300	768,560	1,613	2	2	1,032	15	2	664	11	0	..			3,310	8	4	536	3	0	2	..		
Dusky Hill	3,038,897	..	858,060	2,180,837	8,826	17	4	4,700	15	8	1,522	14	6	..			15,050	7	6	745¾	11	16	7	..		
Greenvale	581,220	..	..	581,220	1,643	14	8	422	14	9	1,865	18	8	..			3,932	8	1	377	4	7	1	..		
Waitahuna	42,025	..	11,500	30,525	88	8	3	91	6	2	66	10	1	..			246	4	6	11	8	0	8	..		
Gimmerburn	936,235	..	783,339	152,896	1,134	4	0	1,203	14	6	613	8	7	..			2,951	7	1	88	12	17	8	..		
Naseby	4,233,128	..	542,625	3,690,503	6,758	14	5	3,779	4	5	1,688	11	6	..			12,226	10	4	1,485	4	11	0	..		
Hanmer Springs ..	9,239,408	..	1,507,224	7,732,184	15,807	4	1	5,763	2	8	4,948	19	11	42	7	2	26,561	13	10	2,886½	5	9	6	..		
Balmoral	872,447	..	..	872,447	2,944	7	7	503	0	3	4,024	3	4	..			7,471	11	2	456	6	9	1	..		
Tekapo	48,000	..	..	48,000	148	8	11	23	9	4	5	10	0	..			177	8	3	29	5	2	0	..		
Dumgree	1,679,765	..	1,110,125	569,640	6,462	17	2	1,772	13	4	4,229	14	3	..			12,465	4	9	209	*			..		
Galloway†	6,930	..	3,050	3,880	18	13	0	3	10	0	46	16	10	..			68	19	10	2	..			..		
Omarama†	4,390	..	..	4,390	25	0	8	..			44	12	1	..			69	12	9	2	..			..		
Raincliff	..	..	..	50,000	..			..			..			..			1,104	12	5	206	..			..		
	89,354,061	192,846	18,313,306	71,283,601	140,142	19	2	80,186	0	4	46,570	0	11	2,878	2	5	270,881	15	3	32,358¾	..			..		

* Data not available. † Experimental.

REPORT ON AFFORESTATION OPERATIONS IN THE NORTH ISLAND.

(By H. A. Goudie, Superintending Nurseryman for North Island.)

Area planted and Trees raised.

During the year an area of 1,633 acres was planted, thus bringing the total area of plantations in the North Island to 21,792 acres.

The trees raised from seeds during the year numbered 3,128,000, and the total raised to date is 60,786,000. Trees to the number of 4,321,500 were in the nursery at the 31st March, half of this number being sufficiently large for transferring to the plantations during the coming winter.

Labour.

The scarcity of labour has made it impossible to carry out much of the work that was planned. Many returned soldiers have been employed, but except in a few cases they remained for only a short time. Any camp made for these men must necessarily be of a temporary character because of the shifting nature of the work, and consequently there are discomforts which many men are not prepared to face. Arrangements are now being made to improve the living-conditions, because many returned men are not physically fit to rough it. A kitchen building of sufficient dimensions to accommodate forty men when dining is being erected, and, although the men will be required to live in tents, these are being provided with wooden floors, and are reasonably comfortable. It is hoped that by making the conditions more attractive many returned soldiers will be induced to accept work on the plantations. The open-air life and good climatic conditions obtaining in the Rotorua district have a recuperative value which will probably be availed of by many returned soldiers.

Tree-seeds.

The results obtained with imported tree-seeds last season were very disappointing as regards the percentage of germination. Owing to war conditions, supplies of tree-seeds from abroad are more costly and difficult to procure, and until some better system for obtaining supplies is arranged it would be wise to restrict the imports to bare necessities. In order to keep the prisoners employed and to provide for the employment of returned soldiers the tree-planting could in the meantime be confined chiefly to *Pinus radiata*, seeds of which can be got in abundance in the Dominion. Although many kinds of tree-seeds can be collected, few are as plentiful as *Pinus radiata*, and several of the kinds most needed by the Department cannot be got. Many species of *Eucalyptus* can be secured, and during last spring about 1 cwt. of seed of several species, comprising chiefly *E. Macarthuri*, *E. eugenioides*, and *E. viminalis*, were collected under the supervision of an officer of the Department.

Smaller quantities of *Cupressus Lawsoniana* and *Cupressus macrocarpa* were also collected. Whilst the cost of collecting seeds from standing trees is greater than the price usually paid for imported seeds, the locally saved seed is cheaper in the long-run because of the higher rate of germination.

Sale of Trees to Farmers.

The number of trees sold to farmers during the year was 261,000, or nearly double the number sold during the previous year. From the continued increase in the demand for trees it is justifiable to conclude that the scheme is both popular and successful. The wisdom of the Government in encouraging and assisting farmers to plant trees may not be generally felt at the present time, but it will not be many years before it is realized that the planting now being done is of very great importance to the Dominion. Each farmer who plants a shelter-belt derives a direct benefit to himself therefrom, and if tree-planting is undertaken by many farmers in a district the aggregate of this is of distinct benefit to the district from a climatic, scenic, and economic point of view. The value of the State's share in this work lies in the supplying of suitable trees, true to name and of the best strain, and thus ensuring the planting of only such kinds as are valuable in their respective classes. It has been found that the demand for tree-seeds had to be met, and consequently stocks of a variety of seeds, principally *Eucalyptus*, have been collected.

During the year the tree-seeds sold aggregated about 56 lb. in weight, and were supplied principally in 1 oz. packets. In the course of time, as the plantations mature, the Department will have more facilities for collecting tree-seeds, and it is probable that this will become a very important branch of the work. For the coming season a variety of useful eucalypts and conifers is being offered for sale.

Eucalypt plants will be sold in trays, and it is hoped that this method will not only enable the more difficult kinds to be successfully transplanted, but that it will ensure the plants arriving at their destination in a satisfactory condition.

Prison Labour.

During the year prisoners performed work to the value of £2,522 15s. 2d., the average earning per man being £89 17s. 6d. The summary given hereunder shows the value of work performed at Kaingaroa Plains, the only plantation where prison labour is now employed, and for comparison the particulars of work done at Waiotapu and Whakarewarewa Plantations. The total value of tree-planting work done by prisoners to date is £47,008 12s. 11d. Following is the summary referred to:—

Summary of Prison Labour.

Station.	Year.	Period.	Total Value of Work performed.	Average Daily Number of Men employed during Period.	Average Value of Work per Man per Year.
		Years.	£ s. d.		£ s. d.
Whakarewarewa Plantation ..	1904–17	12·58	12,518 7 10	12·86	77 7 7
Waiotapu Plantation	1900–13	12·08	24,665 2 6	30·22	67 11 3
Kaingaroa Plains Plantation ..	1917–18	1·00	2,522 15 2	28·07	89 17 6
,, ..	1912–18	5·08	9,825 2 7	21·13	91 10 8

Revenue.

The total receipts for the year, details of which are given hereunder, were £1,544 14s. 7d. Sales of trees and tree-seeds amounted to £520, thinnings from plantations £827, while the balance of £197 was principally grazing fees.

Several inquiries have lately been received for mining timbers, and inquiries for firewood have also greatly increased. Owing, however, to the shortage of labour it has not been possible to continue the thinning-work, and consequently much business has had to be rejected.

Receipts for the year were as follows :—

	£ s. d.
Trees (282,350)	473 5 4
Tree-seeds (56 lb.)...	46 15 1
Poles (5,008)	127 12 6
Firewood (442 cords)	689 13 0
Stakes (330)	5 5 6
Battens (1,000)	5 0 0
Grazing, &c.	197 3 2
	£1,544 14 7

The Cost of Plantations.

The balance-sheets which are published with this report should be the means of correcting the erroneous statements which have been made from time to time regarding the cost of the plantations. In articles appearing in the *Journal of Agriculture* and in the publications of the Forestry League it has been asserted that the plantations made by this Department have cost £13 per acre. This sum is made to appear as the original cost without interest, and no allowance is made for the maintenance charges over the twenty years since the work was inaugurated. It has never cost £13 per acre to establish the plantations, and over the whole period under review the actual cost of establishing has averaged under £10 per acre, and this includes much necessary experimental work.

A summary of the balance-sheets for the four plantations in the North Island shows that the actual cost to date (including compound interest) of planting 21,793 acres is £293,514 13s. 3d., or an average per acre of £13 9s. 5d.

General.

The proposals for the coming season are to plant about 1,500 acres with pines. Half of this area is to be planted at Kaingaroa Plains and the remainder at Waiotapu Plantation. The shortage of labour during the year has, however, delayed the preparation work to some extent, and it may not be possible to carry out the proposals in their entirety.

The staff of officers is gradually becoming reduced. Two more go away at an early date, by which time only half the staff will be left.

All the officers deserve the thanks of the Department for the cheerful and willing manner in which they have endeavoured to carry out the extra duties necessitated by the gradual depletion of the staff.

Attached hereto are reports on the several stations under my charge.

Balance-sheets.

Rotorua Nursery, from 1898 to 31st March, 1918—Twenty Years.

Dr.	£ s. d.	£ s. d.
Actual expenditure ..	70,666 12 5	
Interest, compound, at 4 per cent.	30,452 16 0	
		101,119 8 5
Land rental—		
Accumulated rental compounded for twenty years at 4 per cent. of cost		100 1 1
		£101,219 9 6

Cr.	£ s. d.	£ s. d.
Actual receipts ..	1,794 13 8	
Interest, compound, at 4 per cent.	180 7 5	
		1,975 1 1
Trees to plantations ..	69,772 14 0	
Interest, compound, at 4 per cent.	18,632 16 10	
		88,405 10 10
Present value of—		
Buildings, fencing, &c.	3,941 15 3	
Departmental property	2,114 6 9	
		6,056 2 0
Trees in stock (at valuation) ..		4,782 15 7
		£101,219 9 6

Whakarewarewa Plantation, from 1898 to 31st March, 1918—Twenty Years.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
Actual expenditure ..	66,505 7 5		Actual receipts—		
Interest, compound, at 4 per cent.	23,685 1 4		Sale forest material	£1,457 17 3	
		90,190 8 9	Sundries	141 18 3	
Trees from nursery ..	22,942 13 5				1,599 15 6
Interest, compound, at 4 per cent.	7,860 19 1		Interest, compound, at 4 per cent.		64 11 3
		30,803 12 6			1,664 6 9
Land rental—			Present value of—		
Accumulated rental compounded for twenty years at 4 per cent. of cost ..		2,937 3 0	Buildings, fencing, &c.	3,816 5 2	
			Departmental property	143 14 1	
					3,959 19 3
			Balance, being debt on 7,966·34 acres at average of £14 17s. per acre ..		118,306 18 3
		£123,931 4 3			£123,931 4 3

Waiotapu Plantation, from 1899 to 31st March, 1918—Nineteen Years.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
Actual expenditure ..	54,621 6 7		Actual receipts—		
Interest, compound, at 4 per cent.	22,081 12 4		Sale forest material	£417 17 0	
		76,702 18 11	Sundries	3 12 0	
Trees from nursery ..	28,569 0 9				421 9 0
Interest, compound, at 4 per cent.	9,841 5 1		Interest, compound, at 4 per cent.		7 15 10
		38,410 5 10			429 4 10
Land rental—			Present value of—		
Accumulated rental compounded for nineteen years at 4 per cent. of cost		2,209 18 7	Buildings, fencing, &c.	3,146 9 6	
			Departmental property	318 16 11	
					3,465 6 5
			Balance, being debt on 7,704·43 acres at average of £14 14s. 6d. per acre ..		113,428 12 1
		£117,323 3 4			£117,323 3 4

Kaingaroa Plains Plantation, from 1911 to 31st March, 1918—Seven Years.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
Actual expenditure ..	18,699 12 5		Actual receipts—Sundries	124 4 0	
Interest, compound, at 4 per cent.	2,982 17 11		Interest, compound, at 4 per cent.	13 8 3	
		21,682 10 4			137 12 3
Trees from nursery ..	17,215 13 8		Present value of—		
Interest, compound, at 4 per cent.	861 4 0		Buildings, fencing, &c.	3,589 1 3	
		18,076 17 8	Departmental property	515 2 11	
					4,104 4 2
Land rental—			Balance, being debt on 4,922·29 acres at average of £7 15s. per acre ..		38,151 19 2
Accumulated rental compounded for seven years at 4 per cent. of cost		2,634 7 7			
		£42,393 15 7			£42,393 15 7

Puhipuhi Plantation, from 1904 to 31st March, 1918—Fourteen Years.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
Actual expenditure ..	12,960 12 5		Actual receipts—Sundries		18 0 0
Interest, compound, at 4 per cent.	5,334 0 4		Present value of—		
		18,294 12 9	Buildings, fencing, &c. ..	365 0 10	
Trees from nursery ..	3,392 4 8*		Departmental property ..	38 12 2	
Interest, compound, at 4 per cent.	1,123 1 0				403 13 0
		4,515 5 8	Balance, being debt on 1,200 acres at average of £18 17s. 2d. per acre ..		22,627 3 0
Land rental—					
Accumulated rental compounded for fourteen years at 4 per cent. of cost		238 17 7			
		£23,048 16 0			£23,048 16 0

* £2,346 18s. 6d. of this amount is the value of trees received from the Ruatangata Nursery, which was closed down in 1910.

Rotorua Nursery.

A successful year was experienced at this nursery. The summer rainfall was much heavier than usual, and the growth generally is good.

The crop of seedlings raised during the year is estimated at 3,128,000, details of which are appended. A satisfactory germination was obtained with all of the locally saved seeds, but the imported coniferous seeds were very disappointing. Douglas fir and Corsican pine germinated at the rate of 1 per cent.; Weymouth pine, 2 per cent.; *P. ponderosa* var. *scopulorum*, 22 per cent.; *P. radiata* (locally saved), 40 per cent. All the eucalypts germinated splendidly. The growth made by the Douglas fir is good; the eucalypts are all very good; all other conifers have made a satisfactory growth.

The output of trees during the year totalled 2,920,795. Since the inception of the nursery 56,465,174 trees have been sent out. A total of 261,735 trees were sold to farmers, and 4,850 were supplied free of charge to soldier settlers. The mossing of eucalypti will next season be discontinued, and instead it is proposed to try sending the trees out in trays. About 200,000 trees are available for selling to farmers during the coming season.

Trial lots of a number of species of *Eucalpytus* were planted out last spring, and in almost every instance good growth has resulted. A number of the specimens are of botanical interest only, and while in some instances phenomenally vigorous growth has taken place, they are not worth recording individually. Of the economically important species, *E. gigantea* (syn. *E. delegatensis*), *E. diversicolor*, *E. resinifera* var. *grandiflora*, and *E. pilularis* have each individual trees which are now 6 ft. tall, while as a whole these species have made splendid growth. As the trees are only eighteen months old from seed, the growth may be considered very good. Specimens of *E. Smithii* planted a few years ago were last summer badly attacked with the larvæ of the weevil *Oxyops*. *E. Smithii* is a species of considerable economic importance, and was growing well here. It is therefore very regrettable that it is so susceptible to the insect pest mentioned. *E. globulus* and *E. Smithii* are the only species tried here which have been seriously attacked by the weevil larvæ.

Several uncultivable areas within the nursery enclosure were planted with *Eucalptus*—principally *E. Macarthuri*. Very good results have been obtained with these, and it is intended to make further plantings of a similar nature during the coming year. In addition to the prospective value of these small areas for the production of fencing-material, the tree-growth is badly needed in the meantime to suppress the growth of blackberry, a weed that is likely to become a serious nuisance in this district.

A much-needed addition was made to the office during the year.

Owing to the corroding influence of the vapour from the thermal springs, the wire fences do not last more than five years. At the present time a great deal of repairs are necessary, and these are being effected by erecting post-and-rail fences. It is proposed to replace all the wire fences with post-and-rail during the coming year.

The number of trees in the nursery at the 31st March was 4,321,500. It is estimated that to date 60,786,000 trees have been raised.

Attached hereto are schedules of trees in the nursery and trees transferred to plantations during the year.

The average daily number of men employed during the year was 28·06.

Following is a record of the rainfall and temperatures for the year :—

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	5·76	18	73	34	..
May	6·03	17	71	30	3
June	7·42	14	61	24	10
July	7·31	21	61	27	6
August	4·56	17	65	28	8
September	5·04	17	75	30	2
October	4·11	17	70	29	1
November	4·17	7	78	38	..
December	1·98	9	78	35	..
1918.					
January	4·44	13	81	46	..
February	6·38	10	84	40	..
March	5·55	12	80	37	..
Totals	62·75	172	..	..	30

Details of One-year-old Trees, sown 1917.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Amount of Seed sown.	Growth.
			lb. oz.	
Cupressus Lawsoniana	36,000	4	2 0	Very good.
,, *macrocarpa*	10,000	3	2 0	,,
Eucalyptus acervula	8,000		0 0½	,,
,, *Andrewsii*	1,000		0 2	,,
,, *botryoides*	8,000		0 7	,,
,, *eugenioides*	8,000		1 7	,,
,, *fastigata*	8,000		0 14	,,
,, *Macarthuri*	100,000	4 to 12	3 8	,,
,, *obliqua*	8,000		1 1	,,
,, *pilularis*	5,000		0 5½	,,
,, *regnans*	8,000		0 3	,,
,, *saligna*	8,000		0 10	,,
,, *viminalis*	30,000		1 0	,,
Pinus Laricio	450,000	1½	150 0	Good.
,, *ponderosa* var. *scopulorum* ..	1,000,000	1½	300 0	,,
,, *radiata*	1,250,000	6	200 0	,,
,, *strobus*	60,000	1 to 1½	100 0	,,
Pseudo-tsuga Douglasii	130,000	4	300 0	Very good.
Total	3,128,000			

Details of Two-year-old Trees, sown 1916.

Name of Tree.	Number in Nursery Rows.	Height, in Inches.	Growth.
Cupressus Lawsoniana	18,000	12 to 18	Very good.
,, *macrocarpa*	2,000	12 to 18	
Pinus Banksiana	25,000	5	
,, *Laricio*	40,000	5	
Sequoia sempervirens	500	18	
Total	85,500		

Details of Three-year-old Trees, sown 1915.

Name of Tree.	Number in Nursery Rows.	Height, in inches.	Growth.
Pinus Laricio	1,000,000	8	Very good.
,, *ponderosa* var. *scopulorum* ..	60,000	8	,,
,, *sylvestris*	18,000	6	Poor.
,, *strobus*	30,000	7	Good.
Total	1,108,000		

Details of Trees transferred to Plantations, &c., 1917–18.

Where sent.	Name of Tree.	Number.	
Whakarewarewa Plantation ..	*Eucalyptus Macarthuri* ..	40,600	
	Fraxinus americana	300	
	,, *longicuspis*	60	
	,, *quadrangulata* ..	250	
	Liquidambar styraciflua ..	620	
	Pinus Laricio	1,050	
	,, *ponderosa*	6,575	
	,, *radiata*	48,000	
	Picea sitchensis	25	
	Populus serotina	200	
	Pseudo-tsuga Douglasii ..	42,575	
	Sequoia sempervirens	1,640	
			141,895
Waiotapu Plantation	*Pinus Laricio*	238,150	
	,, ,, var. *cebennensis* ..	25	
	,, ,, var. *taurica* ..	2,270	
	,, *Lambertiana*	17	
	,, *Murrayana*	7,100	
	,, *Banksiana*	1,200	
	,, *ponderosa*	84,875	
	,, var. *scopulorum*	249,000	
	Thuja gigantea	150	
			582,787
Kaingaroa Plains Plantation ..	*Cupressus arizonica*	300	
	,, *Macnabiana*	100	
	Eucalyptus gigantea	615	
	Pinus excelsa	20	
	,, *Laricio*	1,142,500	
	,, *Massoniana*	1,035	
	,, *ponderosa* var. *scopulorum*	545,700	
	,, *radiata*	148,430	
			1,838,700
Puhipuhi Plantation	*Eucalyptus resinifera* var. *grandiflora*	65,000	
	,, 8 species	1,450	
	Pinus canariensis	265	
			66,715
Total	..		2,630,097

Summary.

	Number.
Whakarewarewa Plantations, as per details above	141,895
Waiotapu Plantation, as per details above	582,787
Kaingaroa Plains Plantation, as per details above	1,838,700
Puhipuhi Plantation, as per details above	66,715
Sales to farmers (timber and shelter trees)	261,735
Tourist Department, Tongariro Park (heather and fruiting-shrubs)	19,365
Mental Hospitals Department, Tokanui (shelter-trees)	1,250
Military camps, Featherston (shelter-trees)	2,120
Public schools	1,378
Soldier settlers	4,850
Total	2,920,795

Whakarewarewa Plantation.

(Area 10,123 acres; altitude, 1,000 ft. to 2,000 ft.)

The climatic conditions prevailing throughout the year have been very similar to those of the previous year, and for the afforestation operations have been almost perfect. As a result the growth made by the trees has been exceptionally good, and the plantation as a whole bears a remarkably healthy appearance. A few late frosts were experienced, but were not severe, and beyond slightly retarding the growth of tender species on low-lying ground did no material damage. Heavy gales toward the end of the year uprooted a small number of young trees, chiefly fast-growing pines planted on exposed hillsides. Owing to the moist weather experienced

generally throughout the summer months, fires were not so prevalent as usual on the adjoining country, and there were only a few dry spells, when trouble from this source could be anticipated. During one of these periods of dry weather a fire started by a neighbouring settler speedily got beyond his control, but the prompt measures taken by the staff were effectual in keeping it away from the plantation boundary.

Amongst the fine uniform growth of all species that of Monterey pine deserves special mention, vertical growth of from 4 ft. to 6 ft. being quite common on the area planted with this species three years ago. Douglas fir planted during recent years has also done very well, but its comparatively slow growth during the first two years makes its maintenance on heavy bracken country somewhat costly, and in this respect it does not compare favourably with the faster-growing Monterey pine. Of the trees experimented with from time to time for underplanting larch, Californian redwood has proved itself well adapted for this purpose, and, as it ranks high as a timber-tree, it will probably be used extensively when the underplanting of larch becomes general. *Crytomeria japonica* and *Thuja occidentalis* are also species which have succeeded here as underplants, but their economic importance is probably insufficient to warrant their being used to the same extent as redwood.

Operations generally have been carried out during the year under difficulties, the available labour being inadequate to deal with any but the most necessary maintenance work.

Establishing.—With the exception of 19,955 trees used for completing the planting of new area, and 1,640 for underplanting larch, all the trees received from the Rotorua Nursery, numbering 141,895, were used for replacing failures in former years' plantings. The bulk of the failures were amongst Monterey pine and Douglas fir planted during the previous season, and on an area of eucalypts planted two years previously. In replanting the latter area some 40,000 *Eucalyptus Macarthuri* were used, and, although the conditions at the time of planting were favourable, the result has not been very satisfactory, and it would appear that the best results would be obtained here with this species if planted only in warm, sheltered situations. Little further replanting will be necessary on the blocks planted during recent years, but on some of the older blocks the replacing of unsuitable species should be gradually undertaken.

Maintenance.—The expenditure on maintenance work has increased considerably, and has been entailed chiefly in keeping down bracken growth on the fire-breaks and amongst the young trees. On the rough, densely covered bracken country planted during recent years it is necessary to keep down the growth for several seasons in order to avoid suppression of the young plants. During the past year the available labour has been insufficient to keep this work up to the most desirable standard, and consequently the trees on several small areas have not made the progress they would have done under more favourable circumstances. The expenditure on maintenance of trees will probably be about the same for the coming season, after which a considerable decrease should be shown annually. An area of 139 acres of fire-breaks was sown down in permanent pasture, and this will effect a considerable saving in horse-labour. There will always, however, be a heavy expenditure in cutting and burning growth on boundary and other unploughable fire-breaks. Although a small area had to be resown owing to adverse weather conditions at the time of germination, the result of the sowing as a whole is highly satisfactory, and there is now abundant feed for a considerable number of sheep.

At such times as the state of more urgent work would allow, the thinning of a mixed block of larch and Douglas fir has been carried on, the total area thinned amounting to 13½ acres. In this block the majority of the Douglas fir have been outgrown by the larch in the early stages, and it is desirable that thinning should be continued whenever possible in order that the former species may have a fair chance of proper development.

Utilization.—No difficulty has been experienced in disposing of thinnings, the total sales during the year amounting to 4,305 mine-props, 297 cords of firewood, 1,000 battens, and 330 posts and stakes, of a total value of £539 6s. 6d. From 13½ acres of larch thinned 120 cords of firewood and 3,050 mine-props were obtained, and from 3½ acres of *Eucalyptus* 108 cords were taken out. Practically all of the latter has been sold, and the remaining larch sufficiently dry to burn should easily be disposed of during the coming winter.

Proposals for 1918–19.—The replanting of an area of approximately 143 acres planted in 1911 with eucalypts which have proved unsuitable will be undertaken. The area is covered with a dense growth of fern and tutu, which it will be necessary to clear before planting operations can be commenced. Experimental underplanting of native forest on a small scale will also be carried out.

The average daily number of men employed during the year was 18·8.

Summary showing the Area of Whakarewarewa Plantation (7,966·34 Acres in Trees).

How occupied.	Acres.
Pines	3,137·49
Larch	2,557·80
Eucalypti	1,468·70
Spruce and Douglas fir	643·31
Miscellaneous	159·04
Roads, tracks, and fire-breaks	514·43
Land unsuitable for planting, including swamps and creeks, also residence reserves, paddocks, and water-main reserve	1,490·23
Unplanted land	152·80
Total	10,123·80

Waiotapu Plantation.

(Area, 10,618 acres; altitude, 1,200 ft. to 2,000 ft.)

For the third year in succession mild weather conditions have prevailed, the resultant tree-growth throughout the plantation being excellent. Early in December five degrees of frost caused a temporary set-back on some of the larch blocks; the check, though slight, was noticeable over a much greater area than is usually the case when unseasonable frosts are experienced. Strong winds were fairly frequent throughout the summer and autumn months, doing a little damage to the tops of some of the more tender trees. A number of partly suppressed trees, on Block 14, were bent to the ground by mud ejected from Waimangu Geyser. Fortunately the bulk of the trees were large enough to withstand the downfall, otherwise serious loss would have resulted.

The area in trees was increased by 538 acres during the year, making a total of 7,704 acres for this station. Trees to the number of 582,620 were planted out. The block of land being planted is on the Kaingaroa Plains, and the results from this high country are much more satisfactory than on the areas planted in the Waiotapu Valley during the past few years. Tree-growth is very even, there being an almost entire absence of straggling trees, which, due to severe frosts, are frequently to be seen on the low country. The difference in the minimum winter temperature is from five to seven degrees in favour of the new area. All classes of trees are looking well. The highest death-rate is in the Corsican pine, of which 16 per cent. failed to grow. The trees were a particularly fine lot, but a poor burn was obtained in clearing, making "firming" a difficult process. This probably accounted for a proportion of the losses. The advantage of having the young trees fully acclimatized was exemplified in the case of *Pinus ponderosa* var. *scopulorum*, the average failure of this variety being 12 per cent. on the Rotorua Nursery trees, against 6 per cent. on those received from the Kaingaroa Plantation. Moreover, the weather conditions were less favourable to the latter, as at the time of planting a considerable number of the pits had become almost dust-dry. Four other species in small lots were planted out, the average losses being less than 2 per cent. A few *Thuja gigantea* and *Pinus Lambertiana* were planted experimentally as underplants to the thinned larch on Block 2. The heavy shade apparently provides ideal conditions for the *Thuja*, and the young trees have a fine healthy appearance.

The new area being planted links up the Waiotapu and Kaingaroa Plains Plantation Reserves. As the native growth is principally manuka, monoao, tutu, and silver-tussock, and the only bracken likely to be troublesome is confined to two of the blocks, the future expenditure in the maintenance of this area will be trifling in comparison with the older portion of the plantation. For tree-planting an area of 1,680 acres was cleared at a cost of 10s. 3d. per acre, and 1,056,850 pits were made at 6 ft. apart, occupying an area of 873 acres. The cost for pitting and tree-planting was 9s. 10d. and 12s. 2d. per acre respectively.

The rate of growth amongst the older trees has been quite equal to that of any former season. Corsican pine, which probably shows a greater variation in the height-growth, according to situation, than any other species growing on the plantation, has made vigorous growth throughout the tussock valleys, where, previous to the past two seasons, the trees had made very little headway. Excepting for a few specimens sheltered by tutu in the gullies, *Thuja gigantea,* planted pure, are the only trees which do not show any improvement in growth. There is a decided improvement in the leaf canopy in the Monterey-pine compartment, thinned four years ago. A few trees with double leaders were left for soil-protection, but with the increased growing-space these are liable to be broken by high winds, and in falling damage other trees. Since thinning, partly suppressed redwood growing in mixture with larch have made a vigorous growth, and a few of the taller trees have had their tops broken off by the wind. The Weymouth pine underplants to larch, planted two seasons ago, continue to do well, but are of somewhat uneven growth. One specimen measured had a height-growth of 6 ft., while the average height is about 3 ft.

Fire-breaks were kept in order by ploughing, disking, and burning off. Insufficient labour made it possible to clean only the more dangerous places on the boundary. As a means for reducing the expenditure in maintenance, and as a fire-protecting measure, nine miles of sub-dividing fire-breaks, of an approximate area of 90 acres, were worked up, and an autumn sowing of grass-seed will be made. After years of continuous ploughing the surface is in splendid order, and a good take is anticipated. This work will be continued over the whole of the subdividing breaks, and a further sowing made in the spring, bringing the area up to 150 acres. The pasture will be used for grazing sheep. Two houses of four rooms each were erected for the use of the staff, a considerable portion of the building-material used being obtained by dismantling a building formerly used as a kitchen and dining-room by the Prisons Department, which as it stood was quite unsuitable as a residence.

Frames and flooring are now being used when erecting tents for workmen, and the improved accommodation is greatly appreciated by the men. It is proposed to plant up an area of about 900 acres during the coming season. The necessary land is already cleared, and 412,500 pits have been made, occupying about a third of the area. A road will be formed to provide access to the whole of the western portion of the area being planted, and will require to be finished before the season's tree-planting commences. The scarcity of labour was again apparent throughout the year. The actual number of men employed was somewhat above the average, but more than half were engaged on extension work on the Kaingaroa Plains block. As in the past, the majority of the workmen were Maoris. A number of returned soldiers have been employed, but evidently the locality and work is not congenial, as they rarely stop longer than a month or two.

Gangs are frequently working from six to seven miles apart, and the shortage of officers and skilled workmen was keenly felt.

The average number of men employed during the year was 22·84.

Following is a record of rainfall and temperature for the year :—

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	4·88	19	73	25	8
May	4·94	21	70	20	12
June	6·90	13	61	15	15
July	5·61	12	60	17	13
August	4·06	19	60	21	14
September	5·00	18	70	24	8
October	3·20	16	70	21	9
November	4·02	6	75	27	6
December	2·62	12	80	27	6
1918.					
January	3·57	13	85	39	..
February	5·23	12	83	35	..
March	3·58	13	77	27	6
Totals	53·61	184	..	..	97

Summary showing the Area of Waiotapu Plantation (7,704·43 Acres in Trees).

How occupied.	Acres.
Larch	3,310·85
Pines	4,201·13
Eucalypti	180·50
Birch	11·95
Roads, tracks, and fire-breaks	551·08
Unplanted land	2,073·80
Land unsuitable for planting, including swamps, creeks, also reserve for horse-paddocks and residences	288·65
Total	10,617·96

Kaingaroa Plains Plantation.

(Area, 33,355 acres; altitude, 1,800 ft., approximately.)

During the year an area of 1,083 acres was planted, thus making a total area in trees of 4,922 acres. The results amongst the trees planted were on the whole good, the greatest number of failures being amongst the *Pinus radiata*. About 5,000 trees were planted experimentally. The principal trees amongst these were three selected types of *P. radiata*, which were planted late in the season and suffered from dry weather immediately after they were planted. Of 600 *Eucalyptus gigantea* planted, about one-third failed. This species gives promise of being suitable for this locality. *E. Macarthuri* and *E. viminalis* have also succeeded, but the best results have been obtained with plants raised from seed in the temporary nursery here. *E. obliqua* and *E. regnans* failed, both being very tender in the seedling stage. The growth made by the trees in the older parts of the plantation has been very good, and in this respect the Douglas fir and *Pinus ponderosa* are particularly noticeable.

A surveyor and party have been engaged for some months in subdividing and classifying the northern part of the plantation reserve. The work in this direction is nearly completed, and a start will shortly be made on the southern end of the reserve. It is expected that there will be approximately 14,000 acres demarcated for forest purposes and about the same area set aside for grazing-country.

Proposals for Next Year.—Preparations for planting about 1,000 acres are now well in hand. Planting will be done chiefly with *Pinus Laricio* and *Pinus radiata*.

The average daily number employed during the year was—Free labour, 4·25; prison labour, 28·07.

Following is a record of the rainfall and temperature for the year :—

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	5·87	18	70	34	..
May	5·08	16	70	27	3
June	6·46	12	59	23	11
July	5·38	21	58	27	5
August	3·52	19	64	25	11
September	4·46	16	76	28	4
October	3·80	23	72	30	3
November	4·07	12	75	31	2
December	2·55	13	80	36	..
1918.					
January	4·14	18	84	42	..
February	4·75	10	84	44	..
March	4·32	13	79	35	..
Totals	54·40	191	..	..	39

Summary showing the Area of Kaingaroa Plains Plantation (4,922·3 Acres in Trees).

How occupied.	Acres.
Pines	4,556·55
Douglas fir	340·17
Larch and chestnut mixture	25·58
Roads, tracks, and fire-breaks	446·18
Unplanted land	27,986·52
Total	33,355·00

Puhipuhi Plantation.

The rainfall for the year has again been heavy, 91·80 in. falling on 182 days. Good growth has been made by many of the trees, but heavy winds have been prevalent and numbers of the oldest trees have been uprooted.

During the year 66,000 trees were received from Rotorua Nursery and used for replacing deaths in last year's planting. The results have not been altogether good, because, owing to delays on the journey from Rotorua, some of the trees became heated and only the very strong ones survived. Owing to the prevalent heavy winds it is not considered advisable to plant any of the remaining area with *Eucalyptus*, and future plantings will therefore have to be made with *Pinus radiata*. As soon as the exposed ridges are covered with a good growth of pines the growth of the *Eucalyptus* should be greatly improved.

A survey of the compartments and tracks has not yet been made, and will need to be done as soon as an officer can be spared.

Following is a record of the rainfall and temperature for the year :—

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	11·94	12	71	42	..
May	8·57	22	66	36	..
June	11·93	18	64	38	..
July	7·49	22	60	36	..
August	10·20	16	62	32	1
September	5·96	16	64	36	..
October	5·17	12	70	38	..
November	2·25	9	74	40	..
December	2·13	8	84	40	..
1918.					
January	8·94	18	80	40	..
February	11·00	19	78	50	..
March	6·22	10	74	40	..
Totals	91·80	182	..	..	1

REPORT ON AFFORESTATION OPERATIONS IN THE SOUTH ISLAND.

(By R. G. Robinson, Superintending Nurseryman for South Island.)

Climatic conditions generally were only moderately favourable for afforestation operations. Excessive rainfall was experienced at the Canterbury stations, whilst in Otago the other extreme necessitated the application of special measures to overcome wholesale losses in seed-germination. An incident worthy of special notice occurred at Dusky Hill Plantation on the 26th November. During the prevalence of a violent thunderstorm a high, rocky, pine-clad point of the plantation was struck by lighting. A conflagration quickly followed, but by prompt, well-directed energy, the employment of serviceable fire-fighting appliances from the depots in the vicinity, and effective fire-breaks the outbreak was quickly subdued before much damage had resulted. Frosts have neither been of frequent occurrence nor of abnormal severity, and the winter period was characterized by unusual mildness. Reference to the effects of high winds is made elsewhere in this report.

Employment of Returned Soldiers.

The depression in the labour-market necessitated a revision in our projected planting scheme, and; indeed, at times the prospects of being able to carry through even a reasonable amount of work were anything but bright. The actual propagation of trees on the nurseries causes little concern regarding labour, as this work, being of a light nature, does not demand the stamina required for the more laborious phases of preparation of pits, scrub-cutting, planting, &c., on perhaps abrupt hillsides, where much of the Department's work is now being undertaken. Quite a number of discharged soldiers have from time to time supplemented our plantation gangs, but, although several are still in the service and doing excellent work, the large majority, after a stay of a short duration, find the conditions uncongenial and leave. It is reasonable to infer, however, that on peace being declared many returning men will avail themselves of such work as is at present offered by the Forestry Branch, and with this object in view the continued raising of seedlings on at least the present basis is commendable. There is no doubt that in not being able to provide work during wet weather the Department is greatly handicapped, and perhaps the loss of time thereby incurred by workmen is the chief contributing factor to early discontent. As our South Island plantations are scarcely far enough advanced for milling operations, we are unable to dovetail the tree-planting work with that of timber-conversion. Every reasonable effort is directed upon making the camps comfortable, but a movement towards still further improvement in this respect is now being aimed at. At Greenvale Plantation, where employees now "bach," several buildings will be drawn together and converted into a kitchen and dining-room, where meals will be provided at actual cost price. Although this innovation may not meet with the anticipated success, it will surely demonstrate the possibilities of overcoming what now appears to be one of the chief objections raised by men now offering.

In the Tapanui district the services of the more robust schoolboys on Saturdays during the spring and summer periods were obtained for the lighter forms of nursery-work, and the result of the idea so fully justified its adoption that precisely the same means will again be employed when hoeing and weeding operations constitute the principal work on hand.

Sources of Revenue.

Revenue amounting to £1,217 14s. 6d. was received from various sources. Amounts totalling £118 9s. 4d. are still outstanding, but will be included in the next year's transactions. Details of revenue: Sheep, £659 9s. 5d.; wool, £110 6s. 3d.; trees, £390 16s. 10d.; firewood and fencing-posts, £44 2s.; rental of cottage, £13: total, £1,217 14s. 6d.

The question of supplying fuel and fencing-material to the public generally from our older-established plantations is being much discussed of late; but although it has been found beneficial to conduct partial thinning operations on marginal belts of pines, which timber when converted into suitable lengths for convenient cartage is disposed of at a remunerative figure, it would be wise to avoid the danger of too hasty cutting generally in response to popular clamourings. Present indications would point to the reaping of handsome returns from our South Island plantations when trees have attained the desired size for conversion into mining-props, fencing-material, fuel, &c.

Spare arable land was utilized in grain-growing, and after catering for the Department's requirements in this direction some £600 worth of oats and wheat now remain in stock, and will be disposed of when a favourable opportunity occurs.

Brief Allusions to Tree-raising Work.

In raising an estimated number of 3,754,700 seedlings in the nurseries, as detailed in the schedules, the necessary provision for the continuance of our present annual output was made. The greatest success was obtained from the sowing of 200 lb. of *Pinus Laricio* seed, which produced slightly over a million small yet sturdy trees. It is fortunate that we are fairly well stocked with this species, as only a very limited quantity of the Corsican-pine seed is procurable this year from the European market. Through the courtesy of Mr. T. W. Adams, of Greendale, cones of *Pinus Laricio* and *P. ponderosa* will be collected from his Greendale plantations by the Department's representatives, and on extraction seeds will be distributed to the various nurseries for spring sowing.

Special measures were adopted towards the increased propagation of *Pinus radiata*, and in securing some 944,000 strong seedlings of this species the object was certainly accomplished. An interesting experiment was undertaken at Tapanui in sowing *Pinus radiata* seed in drills 6 in. apart and utilizing the ordinary 6 ft. frames for covering the twelve lines sown. A large proportion of the seedlings have developed into abnormally fine specimens of sufficient sturdiness for permanent planting; and, indeed, so gratifying are the results that the idea will be adopted extensively in future operations. Special attention might also be directed to the unusually

large number of 852,000 *Pinus ponderosa* seedlings, which appear to be the desired type of the valuable bull-pine. The germination of *Cupressus macrocarpa* seed was unusually good. Some 120,000 plants of this variety were raised in anticipation of the continued solicitations from farmers for supplies of this shelter-tree.

Growing of Eucalypts.—Realizing the importance of hardwood-growing, each South Island station is now persevering with the propagation of the hardier species in the hope of being able to harden off and plant out the gums in fair numbers on the areas now being worked. Hitherto repeated trials with even the hardy *Eucalyptus viminalis* failed to produce satisfactory growing percentages. The initiation of the tray system two years ago, however, has simplified the question, although this method entails a good deal of extra labour. The number "pricked off" was quite insufficient to meet the requirements of farmers; but better provision will be made in view of a brisk demand for the trees next season. Pronounced success attended an experimental planting at Greenvale. An area of about an acre was ploughed and cultivated, and in October planted out in several species of eucalypts from trays. It will be interesting to discover their relative merits from a frost-resisting point of view, and compare their development with that of similar trees allocated virgin tussock land.

Extension of Plantations.

Although the acreages of plantations have not been increased to the extent anticipated, the season's work shows a decided advance on that of the preceding one. Some 2,095,450 trees were used in planting out a new area of 1,020½ acres, in addition to the utilization of a fair number of trees for replanting purposes. In the absence of an accurate survey it is impossible to give perfectly reliable acreages of trees planted since initiation. The compilation of the table hereunder, however, has been made from past records, and, although its complete revision will be effected during the coming year, the statement submitted will nevertheless disclose somewhat effectively data relating to the planting systems followed, and averages of the various trees now under "pure" and "mixed" stands.

Acreages of Trees planted in the South Island (Pure).

	Acres.		Acres.
Pinus Laricio	1,614	*Fraxinus excelsior*	27¾
,, *ponderosa*	771	,, *americana*	3
,, *Benthamiana*	19½	*Betula alba*	66
,, *radiata*	1,177¼	*Populus* (species)	39
,, *austriaca*	1,003¾	*Salix* (species)	7¾
,, *pinaster*	15	*Alnus glutinosa*	97¼
,, *muricata*	46¾	*Fagus sylvatica*	2
,, *strobus*	3	*Eucalyptus*	26½
,, *rigida*	1	*Thuja plicata*	14½
,, *contorta*	½	*Cupressus macrocarpa*	8
,, *halepensis*	½	,, *Lawsoniana*	2½
,, *Thunbergii*	1	*Sequoia gigantea*	4½
,, *Tæda*	3	,, *sempervirens*	½
,, species (experimental)	2	*Robinia pseudo-acacia*	2
Larix europaea	2,585	*Quercus pedunculata*	7½
,, *leptolepis*	10¾	*Acer pseudo-platanus*	6
Picea excelsa	222½	*Pyrus aucuparia*	4
,, *sitchensis*	13¼		
Pseudo-tsuga taxifolia	74	Total	7,882½

Acreages of Trees planted in the South Island (Mixed).

(Does not include acreages at Dumgree, Tekapo, and Waitahuna Plantations, complete records of which have not yet been ascertained.)

	Acres.		Acres.
Pinus Laricio and *P. ponderosa*	1,250	*Pinus ponderosa* and *Quercus pedunculata*	1¼
,, and *Pseudo-tsuga taxifolia*	140½	*Pinus austriaca* and *Quercus pedunculata*	6
,, and *P. Benthamiana*	145	*Larix europaea, Pseudo-tsuga taxifolia,* and *Fraxinus excelsior*	9
,, and *Larix europaea*	10	*Pinus austriaca, Quercus pedunculata, Acer pseudo-platanus,* and *Fraxinus excelsior*	1¼
Pinus ponderosa and *P. austriaca*	159½	*Pinus radiata* and *Picea excelsa*	1
,, and *P. Benthamiana*	42	*Pinus radiata, Quercus pedunculata,* and *Acer pseudo-platanus*	4½
,, and *Larix europaea*	14	*Picea excelsa* and *Fraxinus excelsior*	17½
Picea excelsa and *Fraxinus excelsior*	225	*Pinus austriaca, Larix europaea,* and *Betula alba*	23
Acer pseudo-platanus and *Quercus pedunculata*	88¼		
Picea excelsa and *P. sitchensis*	62	Total	2,227¼
Quercus pedunculata, Fraxinus excelsior, and *Acer pseudo-platanus*	8½		
Pinus austriaca, P. Laricio, and *P. ponderosa*	12½		
Pinus Laricio and *Quercus pedunculata*	6½		

	Acres.
Areas planted "pure"	7,882½
Areas planted "mixed"	2,227¼
Total	10,109¾

The rigid climatic conditions in the South insist upon the utilization of only sturdy transplanted trees if a reasonable measure of success is to be the outcome, and repeated experiences prove the uselessness of endeavouring to afforest our exposed lands with small seedlings after the manner applicable to more favoured semi-tropical localities.

Trees for Farmers, and Advisory Work.

With increased knowledge of the probable requirements of farmers it has been possible to make the distribution scheme more attractive this year, although again the shortage of the more popular shelter-trees to some extent influenced the distribution. To some 217 applicants a total number of 226,560 trees, valued at £476 5s. 5d., were supplied from the following nurseries: Tapanui, 161,100; Hanmer Springs, 38,200; Ranfurly, 27,260. The South Island stations have thus distributed 87,708 more trees this season than in the previous year. Although fast-growing varieties were much in demand, timber-trees were also much sought after, as the following statement will disclose: *Pinus Laricio*, 81,400; *Pinus radiata*, 77,117; *Pinus ponderosa*, 17,875; *Pinus muricata*, 13,075; *Pinus pinaster*, 1,575; *Cupressus macrocarpa*, 7,270; *Pseudo-tsuga taxifolia*, 3,837; *Populus fastigiata*, 13,881; *Populus deltoides*, 2,275; eucalypts, 3,702; *Larix europaea*, 3,500; various trees, 1,053. Most gratifying reports have been received from applicants generally regarding the success that has attended their operations with the trees supplied, although in several cases sufficient precaution had not been taken to protect the young plantations against the ravages of the rabbit pest.

Much advisory work was undertaken, although the necessary amount of clerical work indispensable from an expanding branch insisted upon brevity in many cases that perhaps warranted the devotion of more intense co-operation. The newly revised printed price-list, containing also a few cultural notes, will likely provide the desired assistance to many intending tree-planters; but there still appears to be scope for the publication of practically written articles, specializing on matters that require greater emphasis and more elaborate detail.

Grazing Proposition, and Remarks on Fire-breaks.

It is again possible to present a satisfactory statement of stock transactions, which, however, have been confined solely to the Tapanui district this season. Owing to the high cost of breeding-ewes in the Canterbury Province it was decided to defer the renewal of the departmental flock there and temporarily lease the planted reserve at a very remunerative figure. To the presence of the sheep must be attributed the excellent condition of our internal fire-breaks, which have throughout the year been in an absolutely effective state without the Department having had recourse to the usual costly cultivation work. So far little expenditure has been devoted to the construction of fences and yards, and even the shearing of the flock was undertaken by one of the staff. Inexpensive drafting-yards and small holding-paddocks at each grazing-station will be formed immediately, as the mustering operations proved to be intensely trying this season, notwithstanding the engagement of expert men with trained dogs. The dense shelter afforded by trees makes the whereabouts of many stragglers a mystery, and dogs are not eager to search in the thicket. Efforts to secure a suitable man to undertake the combined duties of rabbiter and shepherd have so far proved fruitless. Advantage was taken to dispose of our old ewes and lambs at high-water-mark prices, whilst at a late auction sale the flock was replenished with a much better line of sound-mouth ewes at reasonable prices.

The actual profit on the year's transactions, as shown on the statement hereunder, amounts to £258 4s. 2d.

Statement of Stock Transactions.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Balance forward at 1st April, 1917 ..	689	6	0	Sale of sheep and lambs	768	18	6
Additional purchases during year ..	647	7	10	Sale of wool	140	1	1
Management expenses, mustering, dipping, shearing, &c.	40	5	0	Stock on hand, 31st March, 1918 (at valuation)	750	17	10
Commission on sales	19	4	5				
Fencing, &c.	5	10	0				
Balance, being profit on year's transactions	258	4	2				
	£1,659	17	5		£1,659	17	5

Although this result is not so satisfactory as in the previous year, we are able to disclose a total profit of £816 5s. 1d. on the sheep-breeding venture over a period of three years, irrespective of the dispensation of labour previously involved in bringing about the same result. Perhaps the prime cause of the reduced profit was the lighter lambing, which was adversely influenced by not having sufficient holding-paddocks before the flocks were liberated. This drawback, however, has been remedied this year, and the outcome can be regarded with confidence.

Survey Work.

The abnormal circumstances arising from the war have caused an unavoidable delay in the projected survey of the southern plantations and presentation of planting plans. This work, however, is gradually being assembled, and an earnest endeavour will be made to submit complete reliable records in the next annual reports. Labouring under difficulties, Surveyor Leonard prepared excellent plans of Dusky Hill, Naseby, and Greenvale Plantations, whilst that of Conical Hills Plantation will be available at an early date. At Balmoral Plantation the subdivision by Surveyor Sutton of 7,636 acres into blocks of approximately 250 acres, with suitably defined

roads and fire-breaks, was completed, and extension work here will in consequence be simplified. Arrangements are now in hand for the immediate survey of Hanmer Springs Plantation, after which it is hoped that the young forests at Dumgree and Waitahuna will be similarly dealt with. The adoption of a more elaborate yet highly necessary method of keeping plantation records, together with more voluminous correspondence inseparable from an expanding branch, has so increased clerical duties that it has been found impossible to undertake phases of plantation operations that are in urgent need of my personal superintendence.

Diseases in Plantations.

Perhaps a few passing references to certain tree-diseases that have more or less influenced our operations of late may not be out of place here. It is obvious that with advancing age our plantations will require more intense watchfulness for early symptoms of fungus or insect disease, as in many cases remedial measures may be applied with successful results if undertaken at the right moment. The climatic conditions this season have evidently favoured the establishment and diffusion of fungus troubles. Although *Betula alba* (English birch) is not extensively used in our scheme beyond marginal planting, it is regrettable that this handsome tree has fallen a victim to the disorder—*Melampsoridium betulinae*—that causes much disfigurement to the foliage and hastens leaf-fall. The uredo-spores and teleuto-spores are produced on birch, and the other stages on larch, which tree usually acts as intermediate host. The seedlings at Tapanui, on disclosing symptoms of the trouble, were immediately sprayed with a fungicide—bordeaux mixture—but the difficulty in applying the spray evenly over the affected surface discounted to some extent the effectiveness of the treatment. The birches will be kept under special observation, and reported upon when circumstances warrant.

Another fungus disease that threatens to be troublesome is *Lophodermium pinastri*—pine-needle cast—which affects *Pinus radiata* in both the young and advanced stages. So far only isolated cases of the fungus on our nurseries are known. From the third year onward the affection is noticeable on certain trees, although occupying situations generally regarded as favourable for pine-growing. The tree leaders of affected trees appear to gradually decrease their annual vertical development, and lateral branches become comparatively bare. In view of the enthusiasm shown by experts generally towards and the projected increased planting of this fast-growing pine, it would be wise to collect further evidence from districts where premature pine-decay has arisen from an unrecognized malady.

Each plantation contains a small area that is devoted to the production of *Pinus austriaca*. From the seed-bed stage these Austrian pines are attacked with the aphis, *Chermes pini*, and after eighteen years in permanent positions have failed to become free from the pest. Naturally progress is much interfered with, although more minute investigations disclose the fact that in humid situations, where tree-development is more rapid, the insects are not so numerically strong. In a great many instances, where the Austrian is used in admixture with one of the more healthful pines, early suppression of the infested tree may be looked for. An interesting demonstration of the comparative resistance to the needle-shedding fungus of the European larch (*Larix europaea*) and the Japanese species (*Larix leptolepis*) is in evidence at Dusky Hill Plantation, where side by side may be seen the two species growing in precisely similar conditions. Trees of the European species under stress of a trying dry summer have been almost entirely defoliated, whilst the needles of their Japanese neighbours, even at this late date, are still hanging tenaciously to the twigs. The European larch, however, has proved so far to be a slightly faster grower, although there can be no doubt that it is more susceptible to the premature needle-shedding, and consequently more liable to decay before the millable stage has been attained. The thanks of the Department are due to Mr. A. H. Cockayne, Biologist to the Department of Agriculture, for his cheerful co-operation in research matters.

General.

Although considerably over three million trees will be available for transportation from the nurseries to the operating plantations this season, our output will depend a good deal upon the condition of the labour-market during the approaching winter and spring periods. The anticipated success was not achieved at Tekapo Plantation; but in addition to undertaking the replanting of failures here another small area in the locality will be planted out with hardy trees suitable for the conditions.

Latest reports from Omarama disclose the fact that the experimental work conducted there was very successful. Should the Department at any time have occasion to use any portion of the large afforestation reserve adjoining, information already secured will enable us to launch out with confidence.

In compliance with military demands the gradual exodus of officers and experienced employees is taking place, and additional duties are in consequence imposed upon those remaining. Already, however, the strain is being keenly felt, and the temporary cessation of expansion work will require to be considered should the official list be further depleted.

I have to express my gratitude to the various officers, who have cheerfully assisted me to carry on the year's operations satisfactorily.

Dusky Hill Plantation, Otago.

(Area, 845 acres; altitude, 400 ft. to 800 ft.; commenced operations, 1898.)

The weather conditions prevailing here during the past year were not conducive to the healthy development of trees. A mild winter followed by an unusually dry spring accounted for an early cessation of tree-growth, particularly in larch, which have again prematurely shed their needles. There is no doubt, however, that a steady girth-development is being made by the larch, and notwithstanding contrary opinions expressed in certain quarters it is evident that at least at this station the larch plantations will prove a fairly remunerative proposition. A fairly uniform progress may be noticed in the various pine, spruce, and oak blocks.

The expenditure during the year amounted to £454 4s. 4d., which amount was required for the general maintenance of the plantation, purchase of sheep, &c. The grazing proposition was fairly successful this year, although experience now gained proves that at present the constant feeding-capacity of the reserve, without providing winter feed, is in the region of a hundred ewes. Much difficulty was experienced in mustering the flock, but the results attained fully justify the continuation of the scheme.

Acreages of Trees planted.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus Laricio	155	..
„ *ponderosa*	21	..
„ *radiata*	22¾	..
„ *austriaca*	62¾	..
„ *muricata*	1¾	..
„ *pinaster*	7½	..
Larix europaea	233	..
„ *leptolepis*	1¼	..
Picea excelsa	71½	..
„ *sitchensis*	4¾	..
Pseudo-tsuga taxifolia	17	..
Fraxinus excelsior	11¾	..
Alnus glutinosa	4¾	..
Acer pseudo-platanus	4½	..
Betula alba	12¼	..
Quercus pedunculata	5½	..
Populus deltoides	8	..
Quercus pedunculata, *Fraxinus excelsior*, and *Acer pseudo-platanus*	..	8½
Quercus pedunculata and *Acer pseudo-platanus*	..	28¼
Pinus ponderosa and *P. austriaca*	..	4½
Pinus austriaca, *P. Laricio*, and *P. ponderosa*	..	12½
Pinus Laricio and *Quercus pedunculata*	..	6½
Pinus ponderosa and *Quercus pedunculata*	..	1¼
Pinus austriaca and *Quercus pedunculata*	..	6
Larix europaea, *Pseudo-tsuga taxifolia*, and *Fraxinus excelsior*	..	9
Pinus austriaca, *Quercus pedunculata*, *Acer pseudo-platanus*, and *Fraxinus excelsior*	..	1¼
Pinus radiata and *Picea excelsa*	..	1
Pinus radiata, *Quercus pedunculata*, and *Acer pseudo-platanus*	..	4½
Picea excelsa and *Fraxinus excelsior*	..	17½
Totals	645	100¾
	745¾	

Tapanui Nursery, Otago.

(Area, 173 acres; altitude, 500 ft.; established, 1897.)

Although an extremely dry summer was experienced and our water-supply completely gave out, the year's tree-raising operations must be regarded as decidedly satisfactory. The rainfall, amounting to 34·48 in., was spread over 158 days, whilst the extremes of shade temperature were 88° and 22° F.

Raising of Seedlings.—As the nursery was well stocked with seedlings, a comparatively small quantity of seed was operated with in the spring-time; but, as disclosed in the appended schedule, some 1,417,500 young trees resulted, and this number should be quite sufficient to meet anticipated requirements. From 110 lb. of seed 600,000 sturdy *Pinus radiata* were raised, and, as these have been given more growing-space, it is reasonable to expect a better growing percentage when their transplantation is undertaken. Another outstanding crop is the 60,000 *Cupressus macrocarpa*, which tree is being propagated more extensively now in order to meet the requirements of private planters. For a similar reason the increased growing of poplars is being aimed at, and over 10,000 cuttings of *Populus deltoides* and *P. fastigiata* were rooted with little loss in the undertaking.

Transplanted Trees.—Slightly over a million and a half yearling and two-year-old trees were transplanted into lines from seed-beds, the operation being conducted under favourable conditions with the average success. The *Pinus radiata* have developed into extremely fine trees, although the dry season retarded their development. A heavy death-rate occurred in handling the *Cupressus macrocarpa;* but the 21,000 trees surviving are very fine trees, and little difficulty should be experienced in effecting successful permanent planting with them. Perhaps the *Pinus Laricio* were the most disappointing of all species lined out; but the success of very close late planting of these trees will likely influence our future methods with the Corsican pines. About 40,000 gums were pricked off into boxes, and a number removed to plantations for permanent planting. The success attending this method of dealing with the eucalypts will permit the easy establishment of gum plantations even in exposed situations.

Horse-feed.—About 35 acres were used in producing sufficient horse-feed for local requirements for the ensuing year. On the oat crop being harvested the land relieved was immediately worked up and sown down in grass, with excellent results. From about 2½ acres some 10 tons of rye and clover were harvested, and probably the presence of sheep on the ground before spring-time in some measure accounted for the abnormal yield. Plenty of turnips are available, and the pastures generally are in a satisfactory condition.

General.—Trees to the number of 775,915 were transferred to State plantations, and 161,100 to private persons under the "trees for farmers" scheme.

Expenditure for the year amounted to £2,207 16s. 8d.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	1·25	9	76	29	4
May	6·69	20	69	28	8
June	1·54	11	64	22	18
July	1·37	11	57	25	20
August	1·86	12	65	22	24
September	4·80	13	76	24	7
October	4·04	18	72	29	2
November	2·29	11	82	30	2
December	4·28	18	83	34	..
1918.					
January	1·63	14	88	31	1
February	1·46	13	85	36	..
March	3·27	8	84	34	..
Totals	34·48	158	..	..	86

Details of One-year-old Trees, sown 1917–18.

Name of Tree.	Number in Seed-beds.	Amount of Seed sown.	Remarks.
		lb.	
Pinus Laricio	240,000	86	Fair plants.
,, *ponderosa*	250,000	62	,,
,, *Banksiana*	150,000	8	,,
,, *radiata*	560,000	110	Very sturdy trees.
,, ,,	40,000		Ditto (in drills).
,, *pinaster*	13,000	4	Very sturdy trees.
,, *muricata*	25,000	5	,,
,, *Taeda*	400	2	Poor crop.
Pseudo-tsuga taxifolia	22,000	11	,,
Cupressus macrocarpa	60,000	7	Germinated well.
,, *Lawsoniana*	6,000	½	Fair results.
Betula alba	20,000	4	Small plants.
Eucalyptus viminalis	14,700	..	These gums were pricked off into boxes and have developed satisfactorily.
,, *Gunnii*	3,100	..	
,, *fastigata*	2,200	..	
,, *Macarthuri*	5,900	..	
,, *regnans*	600	..	
,, *globulus*	2,200	..	
,, *Sieberiana*	500	..	
,, *acervula*	1,900	..	
Total	1,417,500		

Details of Two-year-old Trees, sown 1916–17.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Remarks.
Pinus Laricio	1,200,000	..	All these trees have made satisfactory development, although a fairly heavy death-rate occurred in transplanting *Pinus Laricio*.
,, *ponderosa*	200,000	..	
,, *radiata*	..	160,000	
,, *pinaster*	500	5,000	
,, *muricata*	..	250	
Larix leptolepis	..	8,000	
Pseudo-tsuga taxifolia	..	12,000	
Cupressus macrocarpa	..	21,000	
Populus deltoides	..	4,750	
,, *fastigiata*	..	6,000	
Total	1,400,500	217,000	
	1,617,500		

Details of Three-year-old Trees, sown 1915–16.

Name of Tree.	Number in Nursery-lines.	Remarks.
Pinus Laricio	130,000	Specially well grown.
,, ,, ...	1,500,000	Strong trees in seed-beds.
,, ,, ...	500,000	
,, *ponderosa*	1,500	
,, *Banksiana*	6,500	
,, *Taeda*	170	These trees are all sturdy.
Picea sitchensis	500	
Fraxinus excelsior	7,750	
Various trees and shrubs	5,000	
Total	2,151,420	

Trees transferred from Nursery to Plantations, &c., 1917–18.

Where sent.	Name of Tree.	Number.	
Greenvale Plantation	*Pinus Laricio*	247,500	
	,, *ponderosa*	114,760	
	,, *Benthamiana*	8,675	
	,, *radiata*	174,425	
	Pseudo-tsuga taxifolia	4,250	
	Eucalyptus (species)	19,710	
	Populus deltoides	11,900	
			581,220
Conical Hills Plantation	*Pinus radiata*	..	64,500
Pukerau Plantation	*Pinus radiata*	106,300	
	,, *ponderosa*	6,000	
	Eucalyptus (species)	5,395	
			117,695
Dusky Hill Plantation	*Pinus radiata*	..	12,500
Selwyn Plantation Board	Assorted forest-trees	..	86,300
Public Works Department, Lake Coleridge	,, ...	..	7,200
Mackenzie County Council	,, ...	..	1,000
Cromwell Domain Board	,, ...	..	2,950
Hampden Borough Council	,, ...	..	500
Taieri Lake Domain Board	,, ...	..	2,700
Waihemo Domain Board	,, ...	..	1,450
Justice Department, Paparua Prison Camp	,, ...	..	4,900
Farmers	,, ...	..	54,100
Total	.. ..	..	937,015

Conical Hills Plantation, Otago.

(Area, 3,672 acres; altitude, 400 ft. to 1,050 ft.; commenced operations, 1903.)

A steady rate of development in tree-growth is being made at this station, and particularly pleasing are the *Pinus Laricio* on the eastern slopes. Unfortunately, much of the planted area is exposed to the violent south-westerly winds experienced from time to time in this district, and it is regrettable that we should have been visited by one of these gales at the most critical growing-period of the year. As might be expected, a good deal of damage resulted, although the majority of injured trees are showing evidence of recovery, which will be hastened by judicious pruning. The spruces, which are universally commanding more attention now than for years past, having become established, are developing rapidly, and so far show no traces of disease. On the flats and gullies their headway is more pronounced; but even on the higher altitudes the trees do not yet show the leaning tendency so characteristic of other varieties planted in similar situations. The gradual replanting with *Pinus radiata* of small blocks upon which unsuitable trees were originally planted is being steadily continued. Less horse-work was devoted to the fire-breaks, as the sheep kept most of the unplanted spaces comparatively free from vegetation. The services of the three men employed here have been used entirely for general maintenance work; but on labour becoming more plentiful it will be necessary to numerically increase the staff and undertake various works much in need of attention.

The expenditure for the year amounted to £1,087 16s. 2d., and total to date £32,458 7s. 7d.

Acreages of Trees planted.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus Laricio	1,013	..
,, *radiata*	433	..
,, *austriaca*	169	..
,, *ponderosa*	204	..
,, *muricata*	14	..
,, *Benthamiana*	10	..
,, *strobus*	3	..
,, *rigida*	1	..
,, *pinaster*	2	..
,, *halepensis*	½	..
,, *Taeda*	½	..
Larix europaea	909	..
,, *leptolepis*	4	..
Pseudo-tsuga taxifolia	40	..
Picea excelsa	90	..
,, *sitchensis*	8½	..
Fraxinus excelsior	16	..
,, *americana*	3	..
Betula alba	44	..
Populus (species)	12	..
Alnus glutinosa	20	..
Fagus sylvatica	2	..
Salix viminalis	2	..
Thuja plicata	13	..
Cupressus macrocarpa	6½	..
,, *Lawsoniana*	1	..
Sequoia sempervirens	½	..
Robinia pseudo-acacia	2	..
Quercus pedunculata	2	..
Eucalyptus (species)	2	..
Pinus ponderosa and *P. Benthamiana*	..	42
Picea excelsa and *Fraxinus excelsior*	..	225
Acer pseudo-platanus and *Quercus pedunculata*	..	60
Pinus Laricio and *Larix europaea*	..	10
Picea excelsa and *P. sitchensis*	..	62
Pinus Laricio and *P. ponderosa*	..	27
Pinus ponderosa and *P. austriaca*	..	80
Totals	3,027½	506
	3,533½	

Pukerau Plantation, Otago.

(Area, 628 acres; altitude, from 700 ft. to 1,400 ft.; commenced operations, 1915.)

Very satisfactory headway is being made in tree-growth at this plantation. The "break" of *Pinus ponderosa* is specially promising, and this type of western yellow-pine is evidently admirably adapted for afforesting Otago's exposed hillsides. All *Pinus radiata* are also developing quickly, and giving evidence of partiality to the rough conditions allocated them. Strangely enough, the Corsican pines are not showing up well so far, but this might be attributed to the fact that the trees were somewhat on the small side when planted out. After making good progress for the first year the poplars, although favoured with a good growing season, have made little growth, and the prospects of being able to adhere to our original scheme of marginal planting with even the hardiest species of the *Populus* genus are now poor. The experimental planting is fairly good, and next year a detailed report on each block will be submitted. Much horse-labour has been necessary in cultivating the virgin tussock-clad land used for fire-barriers; but in the course of two or three years this work will be greatly lessened by the introduction of sheep on to the reserve. Nearly all the camps have been dismantled and re-erected at Greenvale Plantation. During the year 106,300 *Pinus radiata* and 6,000 *P. ponderosa* were planted here, leaving an unplanted area remaining of 90 acres, which will be operated upon during the coming season.

The expenditure for the year amounted to £537 1s. 10d., giving employment to an average of 3·4 men. The total expenditure since initiation amounts to £3,310 8s. 4d.

Acreages of Trees planted.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus Laricio	54	..
„ *radiata*	263	..
„ *ponderosa*	145	..
„ *austriaca*	40	..
„ *muricata*	6	..
„ *Benthamiana*	3	..
„ *pinaster*	3	..
„ *Taeda*	1	..
„ *Thunbergii*	1	..
„ (experimental — including *Pinus patula*, *P. Banksiana*, *P. sylvestris*, *P. strobus*, *P. Montezumae*, *P. Murrayana*)	2	..
Larix leptolepis	½	..
Picea excelsa	1	..
Pseudo-tsuga taxifolia	4	..
Eucalyptus (species)	8	..
Populus (species)	3	..
Alnus glutinosa	1	..
Cupressus macrocarpa	½	..
Total	536	..
	536	

Greenvale Plantation, Otago.

(Area, 5,169 acres; altitude, 700 ft. to 1,200 ft.; commenced operations, 1917.)

Work has been carried on here under difficulties owing to the dearth of suitable labour. Notwithstanding a late start, it was possible to plant out some 581,220 trees, as detailed on the following schedule. Generally the result is quite satisfactory, a good average growing percentage and regular development being noticeable even on the poorer hilltops. The preparation of ground on the rough fern-clad hillsides proved to be rather more costly than usual, and it is fortunate that we were favoured by a mild season, otherwise it would not have been possible to operate over several of the rougher gullies. All the pines used have demonstrated their suitability to the positions allotted, and a very interesting trial planting of various species of eucalypts has furnished results that should influence the extension of our gum plantations. A good deal of preliminary fencing-work and camp-formation has been necessary, and the marking-out and ploughing of fire-breaks also occupied some considerable time. As part of the area has now been surveyed by Surveyor Leonard, and the boundaries of the planted blocks defined, it will be possible to carry on the recording-work accurately and expeditiously. During the coming year it will be necessary to erect a further three miles of fencing, to which the attachment of wire netting only is required over the greater distance. Should labour be sufficiently plentiful nearly a million trees will be handled here during the next winter and spring months.

The expenditure for the year was £3,464 7s. 9d., and to date £3,932 8s. 1d.

Acreages of Trees planted.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus Laricio	116	..
„ *ponderosa*	73	..
„ *radiata*	162	..
Eucalyptus (species)	14	..
Pseudo-tsuga taxifolia	3	..
Poplars	9	..
Total	377	..
	377	

RANFURLY NURSERY, CENTRAL OTAGO.

(Area, 49 acres; altitude, 1,400 ft.; established, 1896.)

The past season, although not constituting a record for the amount of precipitation, has nevertheless been a wet one up to a certain point. The total rainfall for the year was 23·04 in., which is 6·83 in. in excess of last year's fall. The wettest period occurred between the months of September and December. Rain was recorded on 115 days during the year, and frost on 101 days.

As far as nursery-work is concerned the season cannot be said to have been altogether satisfactory. Although a wet season is usually welcomed in the district by farmers in general, the larger portion of the rainfall occurred at a period when we could ill spare any lost time—that is, in the spring, when every day must be made the most of for the transplanting of trees, &c. The peculiarly sticky nature of portions of the nursery breaks under the slightest excess of moisture created a difficulty in handling over a million seedlings in time to allow them the full benefit of spring growth. A late start was made with lining-out operations—viz., 1st September—and during October there were only ten days on which this work could be gone on with. Consequently this meant that transplanting was relatively later than usual, and that the later-planted seedlings were really too far advanced to handle with any prospect of success. *Pinus ponderosa* has done fairly well, but in *Pinus Laricio* a rather large percentage of deaths must be recorded. These two species constituted the bulk of the trees lined out this year, and only small quantities of other species were handled. Unfortunately, last year's sowing of *Pinus radiata* was a failure, and therefore none were available for lining out. The total number of trees, cuttings, &c., handled for the season amounted to approximately 1,213,000. It is estimated that some 700,000 trees will be available for transfer to plantations during the coming winter, and, though this number is disappointing when compared to the number of trees lined out, it constitutes a record output for this station. The total number of trees transferred to plantations, settlers, &c., for the year amounted to 587,888. Of this number, some 29,160 trees of various species were supplied to settlers, *Pinus radiata* constituting almost half the number. Very satisfactory reports have been received from time to time as to the success of the trees planted.

Seed-sowing.—This operation, like the lining-out, was retarded by wet weather, and, although in normal seasons it is carried out during the months of August and September, this season it was commenced on the 9th November and completed on the 13th. The ordinary seed-bed ground was not available this year, and a portion of one of the nursery breaks not usually utilized for this purpose was made use of. This had not been previously manured, and owing to the wet weather mentioned could not be worked to the usual fine condition necessary. Consequently the resulting crop of seedlings is not up to expectations. *Pinus Laricio* is again specially poor, but only a small quantity of this was sown, owing to a shortage of seed-frames. *Pinus ponderosa* has done well, as has also *P. radiata* and *P. Banksiana*, while the remainder can only be considered fair. The total number of seedlings resulting from a sowing of 134½ lb. of seed is approximately 866,000.

General.—Several improvements and alterations which were contemplated had to be abandoned owing to the necessity for economy; but the installation of a 3½-horse-power engine and pumping plant has filled a long-felt want. Its usefulness, however, has not been demonstrated to full effect on account of the wet season experienced. The water is pumped to a storage-tank placed on a stand 20 ft. high, and it is also arranged for pumping direct to seed-beds, so that good pressure is always available. A chaffcutter has also been fitted up and geared to the engine, and, although its capacity is not large, it leaves us independent of outside assistance, which is always difficult to obtain in this district when most required. One or two minor

alterations, giving more room or convenience, have been made to buildings; but the greater part of the year has been devoted to weeding seed-beds and attending to nursery-lines, and any permanent improvements are left to the future, when it is hoped that normal conditions of labour, &c., will be restored.

The average number of men employed was 6·04 for the year, but for the four busy months the average was 10·24. This left us with an average of about 4·2 men for the remaining eight months, and they proved quite inadequate to cope with the extra amount of weeding entailed by a wet season. To look after things as they should be in a climate such as we have, I am convinced by the past season's experience that continuous surface cultivation on the American principle of dry farming is the only method to ensure good results amongst lined-out trees at this station, owing to the peculiar nature of the soil. It seems immaterial how good the condition of the soil when planting, it appears to run together again under the slightest amount of rainfall, and the surface then becomes like a road. Continual cultivation seems to be the only method by which it could be kept free, and for this we would require a staff of at least six men all through the growing-period. An alternative would be to leave all trees in seed-beds for three years and transfer direct to plantations, where they appear to strike and do equally as well as lined-out stuff. The seed would require to be sown rather more thinly than usual, and the trees subsequently frequently wrenched. There are one or two species, such as *Pinus radiata*, to which this would not apply, unless sown in lines later in the season and transferred the following season. Under the present difficulty in securing adequate labour during the busy season it might pay to adopt this system. The losses through lining out this season, although it has been a moist one, have been considerable, and, while it might be necessary to eliminate perhaps 10 per cent. for undeveloped trees by the suggested system, the saving in labour, &c., would more than counteract the loss.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	1·62	9	75	28	4
May	3·01	13	62	20	9
June	1·05	6	62	15	24
July	0·52	10	55	24	20
August	1·20	7	59	21	24
September	2·24	10	72	25	10
October	3·37	16	70	28	3
November	1·31	5	79	31	3
December	3·27	16	79	30	2
1918.					
January	1·61	8	88	32	1
February	1·57	7	85	34	..
March	2·27	8	83	33	..
Totals	23·04	115	..	..	100

Details of One-year-old Trees, sown 1917–18.

Name of Tree.	Number in Seed-beds.	Seed sown.	Remarks.
		lb. oz.	
Pinus Laricio	124,000	28 0	Very uneven.
,, *ponderosa*	352,000	70 0	Good germination.
,, *radiata*	144,500	25 0	Germinated very evenly and made good growth.
,, *Banksiana*	213,000	5 0	Good crop.
,, *muricata*	5,000	2 0	Only fair.
Cupressus macrocarpa	10,900	2 0	Fair germination and sturdy trees.
,, *Lawsoniana*	1,600	0 4	Sparse.
Eucalyptus viminalis	5,000	0 6	Good healthy trees.
Populus fastigiata (cuttings)	7,000	..	Strong plants.
,, *deltoides*	3,000	..	,,
Total	866,000		

Details of Two-year-old Trees, sown 1916–17.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Remarks.
Pinus Laricio	175,000	..	Sturdy plants.
,, *ponderosa*	146,500	..	Well-grown trees.
,, *radiata*	24,000	..	Large proportion fit for plantation.
,, *muricata*	6,500	..	Germinated this season.
,, *pinaster*	..	2,000	Very small.
Pseudo-tsuga taxifolia	18,400	..	Germinated this season; strong trees.
Picea excelsa	17,000	..	Strong plants.
Totals	387,400	2,000	
	389,400		

Details of Three-year-old Trees, sown 1915–16.

Name of Tree.	Number in Nursery-lines.	Remarks.
Pinus Laricio	490,000	Majority good trees.
,, *ponderosa*	180,000	Good class of trees.
,, *muricata*	6,000	Poor.
,, *pinaster*	1,000	Only fair.
,, *radiata*	300	Large trees.
Larix leptolepis	5,000	Very poor indeed.
Pseudo-tsuga taxifolia	16,000	Will require another season in lines.
Cupressus macrocarpa	4,000	Well-grown trees.
Total	702,300	

Trees transferred from Nursery to Plantations, &c., 1916–17.

Where sent.	Name of Tree.	Number.	
Naseby Plantation	*Pinus Laricio*	244,350	
	,, *ponderosa*	198,500	
	,, *radiata*	104,193	
	Cupressus macrocarpa	2,137	
	Eucalyptus Macarthuri ..	1,548	
	Populus deltoides	2,400	
	,, *fastigiata*	600	
			533,728
Tapanui Nursery	*Larix europaea*	1,500	
	Cupressus macrocarpa	400	
	Populus fastigiata	5,000	
			6,900
Supplied to settlers	*Pinus Laricio*	3,800	
	,, *ponderosa*	6,700	
	,, *radiata*	12,750	
	Larix europaea	1,300	
	Cupressus macrocarpa	1,100	
	Populus fastigiata	1,225	
	,, *deltoides*	250	
	Eucalyptus Macarthuri ..	135	
			27,260
Total	..		587,888

Naseby Plantation, Central Otago.

(Area, 2,850 acres; altitude, 2,450 ft.; commenced operations, 1900.)

A very successful transplanting season has been experienced at this plantation owing to an abundance of rain throughout. The total rainfall for the year amounted to 28·47 in., rain having fallen on 107 days during the year. Frost occurred on 157 days; but, although larch has been slightly affected, no material damage from this source is noticeable amongst any other species.

Almost all trees have maintained good normal growth, and the plantation generally looks healthy. Established larch has made an average vertical growth of about 2 ft. 6 in., and *Larix leptolepis* is especially healthy-looking, and in many cases has put on fully 3 ft. for the season. This species appeared to be a failure for the first two or three seasons after planting. *Pinus radiata* has, as usual, not transplanted with such success as most other species; but the "strike" is rather above the average usually experienced here. A trial of 1,000 of these planted last autumn proved a success, and hardly a death is recorded, where the previous year's spring planting absolutely failed. By using discrimination in selecting the ground, autumn planting of this species should prove an advantage. This applies to sunny faces and ground where the danger of frost-lifting is remote. Both *Pinus Laricio* and *P. ponderosa*, where they have been established for some years, have made an average growth of 18 in., and in the current season's transplants the losses could be limited to about 3 per cent. at the outside. A small compartment of *Eucalyptus Macarthuri* was experimented with, and, although we have not yet been able to judge the effect of frost, they are at present doing well. *Cupressus macrocarpa* was also tried, but with only indifferent results. Both this species and *Pinus radiata* require to be planted in the season as early as possible, in order that they may have the benefit of the spring rains and become established before the advent of the drying north-westers of the summer months.

Planting was commenced on the 3rd August and completed on the 27th November, the total number of trees dealt with for the season being 553,728. Of this number some 432,104 were planted on new area comprising approximately 234 acres, and the remainder, 121,624, were used to replace blanks—the large number accounted for in this manner being due to blanks not having been attended to for two seasons. The pruning of several large compartments occupied the staff for two months subsequent to the completion of planting operations, and when this was completed pitting by contract was again resumed.

Some 400,000 pits are now available for the reception of the coming season's output, and it is estimated that pits sufficient to accommodate the 700,000 trees expected from Ranfurly Nursery will be completed within the next two months. During the winter one of the division fences was removed and re-erected along the southern boundary, thus enclosing sufficient ground to provide work for the next two seasons. The next extension of the boundary-fence will enclose about 350 acres, and complete the enclosure of the whole of the surveyed plantation area at present held by the Department. All fire-breaks received the usual cultivation necessary to keep down weeds, and one or two additional ones were ploughed where required. Surface cultivation is all that is necessary with the majority of the fire-breaks now, and the addition to the departmental property of a suitable machine would reduce considerably the amount of work required each year in ploughing, provided it could be done in the spring. Rabbiting has been carefully carried on and the pest kept down as well as possible, but it is a difficult matter to keep flood-gates in order owing to freshets in the Eweburn Creek, which each time this occurs makes a new channel. The camps will require to be shifted shortly, and it is proposed to remove them to a more central position, from which it may be possible to work the remaining ground available for tree-planting.

The total expenditure for the year was £1,283 3s. 8d., and the total to date £12,225 10s. 4d.

The average number of men employed during the year was 6·14.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	2·02	7	74	22	12
May	3·81	9	60	24	19
June	0·92	4	60	16	27
July	0·68	9	54	20	23
August	1·53	8	58	16	29
September	2·41	10	64	22	15
October	4·16	14	70	24	11
November	2·30	8	79	26	7
December	3·93	14	78	28	5
1918.					
January	2·14	9	84	30	5
February	1·06	10	86	31	1
March	3·51	7	82	27	3
Totals	28·47	109	..	..	157

Acreages of Trees planted.

Naseby Plantation No. 1.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus austriaca and *P. ponderosa*	..	75
,, *ponderosa* and *P. Laricio*	..	13
,, *austriaca, Larix europaea*, and *Betula alba*	..	23
,, *austriaca*	23	..
Pyrus aucuparia (marginal belt)	4	..
Totals	27	111
	138	

Naseby Plantation No. 2.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus ponderosa and *P. Laricio*	..	460
,, *Laricio*	221	..
,, *ponderosa*	204	..
,, *Benthamiana*	5	..
,, *radiata*	130	..
,, *austriaca*	55	..
Larix europaea	266	..
,, *leptolepis*	5	..
Cupressus macrocarpa	1	..
Eucalyptus Macarthuri	1	..
Populus deltoides	½	..
,, *fastigiata*	½	..
Totals	889	460
	1,349	

GIMMERBURN PLANTATION RESERVE.

(Area, 425 acres; altitude, 1,200 ft.; commenced operations, 1903.)

The cropping of part of the vacant ground at this plantation has been the only work undertaken during the year, an area of about 100 acres having been sown in wheat and oats—50 acres of each. The resulting crop turned out very satisfactory in spite of a rather hurried preparation of the ground, and it is estimated that some 70 tons of oaten sheaf and anything from 400 to 500 sacks of wheat will result. A portion of the oats will be cut into chaff for departmental use, and the remainder will be threshed and disposed of. It is anticipated that the venture will yield a substantial return for the outlay. There is at present a difficulty in getting either threshing or chaff-cutting done, and it will be well on into winter before this work is commenced. It was found necessary to purchase a McCormick reaper-and-binder for cutting the crop, but this machine will amply repay the Department for the expenditure. A good deal of credit is due to the employees, who undertook the ploughing and sowing under rather adverse conditions, and the success of the crop is in great measure due to their zeal in pushing the work through. The same area is again being sown in wheat and oats this coming season, but the work is expected to be completed before winter.

Tree-growth.—As far as the area under trees is concerned, very little need be said. The growth is about normal, but slightly under that of last year. The disease (*Chermes laricis*) is still very prevalent amongst *Pinus austriaca*, and many of the trees are not making much progress. Rabbits still prove difficult to cope with owing to there being no one resident on the plantation, and it would be advisable to run an extra division fence across the plantation at the foot of the planted area. They could then perhaps be eliminated from amongst the trees by trapping and poisoning, and the remaining portion would be easier to manage if they were kept away from the thick cover afforded by the trees. The quality of the soil has been demonstrated this year by the wonderful growth of grass and the crop mentioned above, and there is absolutely no reason why tree-planting should not be successful if carefully handled. The completion of planting is strongly advocated as soon as it is possible to undertake the work.

The expenditure during the year amounted to £266 10s., and total to date £2,684 17s. 1d.

The average number of men employed during the year was 1·84.

Acreages of Trees planted.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus austriaca	74	..
Larix europaea and *Pinus ponderosa*	..	14
Totals	74	14
	88	

HANMER SPRINGS NURSERY, CANTERBURY.

(Area, 40 acres; altitude, 1,225 ft.; established, 1902.)

Rain fell on 139 days during the year, the total precipitation being 59·17 in., showing an increase of 16·30 in. on the rainfall of the preceding twelve months, and an increase of thirty days on which rain fell. The average monthly fall was 4·93 in., the heaviest falls being registered for the months of May, September, and December. The rainfall was, however, well distributed throughout the year, and at no time did dry conditions prevail. The highest shade temperature (89° F.) was registered on the 29th January, and the lowest (17° F.) on the 28th June and 10th August, and frost was recorded on 120 nights. Compared with the temperatures registered during the preceding twelve months little difference was observable.

Tree-growing.—Nursery operations generally were attended with a fair measure of success; but some difficulty was experienced in carrying on works owing to the shortage of labour and the difficulty in procuring efficient workmen, and during the spring months this was particularly acute. As a result the transplanting of the whole of the young trees ready for transfer to nursery-lines could not be carried out, and lining-in was resorted to; but even though the young plants were much more expeditiously dealt with in this manner it was found necessary to allow a large number of seedlings to remain in the seed-beds for a further season. The abnormally wet weather experienced also greatly retarded transplanting operations, a start with this work not being made until almost a month later than usual. The results obtained were not entirely satisfactory with all varieties, *Larix leptolepis*, *Pinus muricata*, and *Cupressus macrocarpa* being poor "strikes"; but all other varieties were quite satisfactory. The number of trees transferred to nursery-lines was 1,193,000. Two- and three-year-old trees have made very fair headway, *Pinus radiata* and *P. muricata* (three-year-olds) making specially rapid growth. The results obtained from the sowing of 248 lb. of seed were highly satisfactory, the estimated crop being 1,471,200 generally sturdy plants, only a few varieties being in any way poor, as will be seen by perusal of schedules attached. It is estimated that about 1,300,000 trees will be available for transfer to plantations, &c., during the coming season. A total of 810,307 trees was sent out from the nursery during the year—772,107 to departmental stations and 38,200 to farmers and others. The total number of trees now on the nursery is 3,487,900.

Horse-feed.—An area of about 44 acres was put down in crop during the spring; but the results were not altogether satisfactory, the yield being much below the average. Owing to the last season's shortage a large amount of chaff and oats had to be procured from Culverden. The hay crop proved more satisfactory, however, and there is abundance of this feed for winter use. The carrot crop is also satisfactory.

General.—All vacant areas on the nursery were again put down in oats, and the stubble ploughed in after harvesting. Roads received attention with regard to shingling and repairs. The general upkeep and cleanliness of stables, workshops, and outbuildings was attended to. Repairs were effected to wagon, implements, tools, &c., where necessary. All fences requiring attention were thoroughly repaired, and are now in good condition. During the year two useful draught mares were purchased for the purpose of supplementing our teams for cartage-work to plantations. Our stock of horses was increased by the addition of a useful-looking filly.

In view of the increased distance to deliver trees from this station—thirty-two miles—and the greater labour involved, it would be advisable to procure a more suitable wagon than the one now in use, which at best will hardly last another season. The installation of a water-wheel for the purpose of supplying power for cutting chaff, wood-cutting, &c., would be a paying proposition, an ample head of water being available. The initial cost would practically cover the expenditure on this item, as subsequent running-costs would be nil. The wheel and necessary accessories could be constructed and installed for under £50, and would result in a yearly saving of chaff-cutting expenses, &c. An additional room is required for the dwelling of the Nurseryman in Charge, and also for that of the Assistant Forester, the accommodation being now too meagre for family comfort. The addition of a hot-water service is also very desirable, the absence of this necessity being a great hardship during the severe winters experienced at this altitude.

The daily average of men employed throughout the year was 7·67.

The expenditure for the year amounted to £1,671 8s. 5d., the total expenditure to date being £18,437 8s. 8d.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1917.	In.		Deg. F.	Deg. F.	
April	3·75	9	79	28	4
May	8·36	15	66	25	10
June	3·97	8	65	17	19
July	4·78	17	61	21	24
August	2·93	11	66	17	27
September	9·28	14	75	22	13
October	3·47	12	75	22	15
November	2·10	8	82	27	6
December	8·70	15	81	30	2
1918.					
January	3·17	7	89	33	..
February	4·64	11	83	39	..
March	4·02	12	80	34	..
Totals	59·17	139	..	..	120

Details of One-year-old Trees, sown 1917–18.

Name of Tree.	Number in Seed-beds.	Amount of Seed sown.	Remarks.
		lb.	
Pinus Laricio	700,000	86	Strong plants.
,, *ponderosa*	250,000	64	,,
,, *radiata*	200,000	75	Good plants.
,, *Banksiana*	150,000	5	Medium plants.
,, *pinaster*	14,000	3	Strong plants.
,, *Taeda*	1,600	1	Medium plants.
,, *muricata*	8,000	2	Good plants.
Picea excelsa	7,000	1	Medium plants.
Cupressus macrocarpa	50,000	4	Strong plants.
,, *Lawsoniana*	7,000	¼	,,
Betula alba	10,000	6	Poor plants.
Eucalyptus viminalis	18,000	..	Good plants.
,, *Stuartiana*	22,000	..	,,
,, *Macarthuri*	400	..	,,
,, *eugenioides*	50	..	Poor plants.
,, *fastigata*	50	..	,,
,, *obliqua*	50	..	,,
,, *acervula*	50	..	,,
Populus deltoides (cuttings)	5,000	..	Well rooted and sturdy.
,, *fastigiata* (cuttings)	28,000	..	Ditto.
Total	1,471,200		

Details of Two-year-old Trees, sown 1916–17.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Remarks.
Pinus Laricio	700,000	..	Strong plants.
,, *ponderosa*	130,000	..	,,
,, *radiata*	..	120,000	,,
,, *muricata*	..	27,000	Poor growth.
,, *pinaster*	..	3,000	,,
Pseudo-tsuga taxifolia	..	40,000	,,
Picea excelsa	..	25,000	,,
Cupressus macrocarpa	..	7,000	Fairly good trees.
Larix leptolepis	40,000	..	,,
Totals	870,000	222,000	
	1,092,000		

Details of Three-year-old Trees, sown 1915–16.

Name of Tree.	Number in Nursery-lines.	Remarks.
Pinus Laricio	600,000	Sturdy trees.
,, *radiata*	120,000	Very sturdy trees.
,, *ponderosa*	130,000	Poor growth generally.
,, *muricata*	70,000	Sturdy trees.
,, *pinaster*	4,000	,,
,, *Benthamiana*	200	Poor.
,, *Taeda*	500	Good trees.
Total	924,700	

Trees transferred from Nursery to Plantations, &c., 1917–18.

Where sent.	Name of Tree.	Number.	
Hanmer Springs Plantation ..	*Pinus radiata*	102,000	
	,, *ponderosa*	10,825	
	,, *muricata*	365	
	,, *Taeda*	250	
	Populus fastigiata	2,525	
			115,965
Balmoral Plantation	*Pinus Laricio*	96,000	
	,, *ponderosa*	177,000	
	,, *austriaca*	300,052	
	,, *radiata*	40,000	
	,, *muricata*	6,640	
	,, *Benthamiana*	2,775	
	,, *pinaster*	4,025	
	Pseudo-tsuga taxifolia	17,525	
	Cupressus macrocarpa	1,175	
	Betula alba	300	
	Eucalyptus Macarthuri ..	500	
	Populus fastigiata	3,400	
	,, *deltoides*	450	
			649,842
Tapanui Nursery	*Pinus muricata*	1,000	
	Populus fastigiata	5,000	
			6,000
Ranfurly Nursery	*Pinus muricata*	..	300
Public bodies and farmers ..	*Pinus ponderosa*	9,200	
	,, *muricata*	7,000	
	,, *radiata*	17,700	
	,, *Laricio*	400	
	,, *pinaster*	400	
	Pseudo-tsuga taxifolia	1,200	
	Populus fastigiata	1,650	
	,, *deltoides*	650	
			38,200
Total	..	..	810,307

HANMER SPRINGS PLANTATION, CANTERBURY.

(Area, 3,668 acres; altitude, 1,225 ft.; commenced operations, 1901.)

Operations at this station for the past year were confined exclusively to the general upkeep of the plantations. The replacing of failures in the more recently planted areas was the principal work carried on during the winter months, a total of 116,015 trees being utilized for this purpose, of the following varieties: *Pinus radiata*, 102,050; *P. muricata*, 365; *P. ponderosa*, 10,825; *P. Laricio*, 20,000; *P. Taeda*, 250; and *Populus fastigiata*, 2,525. A considerable amount of work has still to be done in this respect, and the staff has been employed for the greater part

of the summer months in reopening pits on the Hanmer River area where failures had occurred, and the planting will be taken in hand during the coming winter. Boundary fire-breaks were ploughed throughout. The portions inaccessible to the plough were chipped, thus reducing the risk of fire gaining access from adjoining properties. The discontinuance of sheep-grazing allowed growth to make headway on the internal fire-breaks; but the letting of grazing-rights to St. Helens Station during the autumn months had the desired effect, the growth being quickly eaten off. The usual attention was given to the destruction of hares and rabbits by poisoning, trapping, and shooting. Fences received attention with regard to repairs, and drains were opened up in paddocks where necessary. Some pruning was done to birch adjoining fire-breaks and roads, and the destruction of noxious weeds, such as gorse, broom, and briars, was carried on. A small amount of crop was grown for horse-feed. Two lines of *Pinus muricata* adjoining Jollie's Pass Road were cut out, and the timber was disposed of in the township for fuel, a total of 55 cords being sold. A large number of fencing-posts were sent to Balmoral Plantation. Red deer are becoming more numerous about the district, and have done some damage to trees on the borders of plantations, but have so far managed to escape, though efforts have been frequently made to destroy them.

The standard of tree-growth throughout the plantations was well maintained, and all varieties made good headway with the exception of larch breaks situated on flat country, where needle-cast was very pronounced and had the effect of retarding growth. On the sidelings, however, this disease did not manifest itself, and the trees made good headway and present a healthy appearance. The marginal lines of *Betula alba* were slightly affected with fungus, probably due to the wetness of the season, but have made good headway in spite of this. The disease, however, had the effect of destroying the seed, and there is none available this season. *Picea excelsa* have also made but poor headway, and have not made any appreciable advance during the last few years. It would be advisable to plant up the areas under this tree with any good variety of poplar, and also deal in a similar manner with swamp areas, which are numerous throughout the plantations. Attached hereto are details of trees planted and the area covered since the initiation of tree-planting at this station—area approximate only.

The daily average of men employed throughout the year was 4·41.

The expenditure during the year amounted to £851 9s. 4d., and total expenditure to date £26.561 13s. 10d.

Acreages of Trees planted.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus Laricio and *P. ponderosa*	..	750
„ and *P. Benthamiana*	..	145
„ and *Pseudo-tsuga taxifolia*	..	140½
Pinus radiata	133½	..
„ *austriaca*	361	..
„ *muricata*	17½	..
„ *Taeda*	1½	..
„ *contorta*	½	..
Larix europaea	1,177	..
Picea excelsa	60	..
Cupressus Lawsoniana	1½	..
Alnus glutinosa	71½	..
Betula alba	9½	..
Sequoia gigantea	4½	..
Thuja gigantea	1½	..
Acer pseudo-platanus	1½	..
Eucalyptus (species)	1½	..
Populus (species)	6	..
Salix (species)	2½	..
Totals	1,851	1,035½
	2,886½	

Balmoral Plantation, Canterbury.

(Area, 7,636 acres; altitude, 550 ft.; commenced operations, 1916.)

Operations at this station have again been attended with a fair measure of success during the past season. There was a bountiful rainfall throughout the summer months, which just suited the shingly formation of this station. A general review of the first and second season's operations must at once convince those who had any doubts, and even the most pessimistic, that

tree-planting is so far a pronounced success on this arid waste land. Only a cursory glance is sufficient to show that the trees are thriving and vigorous. Of the various species planted *Pinus ponderosa* predominates, and has evidently found a congenial home in this stony land. *Pinus austriaca* is doing well, as is also *Pinus ponderosa* var. *scopulorum*. The marginal lines of *Populus fastigiata* and *P. deltoides* were not a success generally, only a patchy "strike" taking place, and it is doubtful whether they will succeed in this locality. Trees to the number of 649,842 were received from Hanmer Nursery, and with one or two exceptions there was a good "strike," some small lots of Douglas fir, *Eucalyptus Macarthuri*, and *Pinus pinaster* being the exceptions. In a rather late planting of *Pinus radiata* the death-rate was heavier than usual. Tree-planting in this district should be commenced as soon as possible in early winter and completed early, before the prevailing north-west winds set in.

The remaining unfenced portion of the first area acquired was enclosed with rabbit-proof fencing, the total length of fence being 176½ chains, the whole of the posts for this work being supplied from the Hanmer Plantations. A total of 568,920 pits were opened, and of that number 155,200 are available for the coming season's planting. The additional area, 6,589 acres, which was acquired is for the most part covered with manuka scrub. The whole area was recently surveyed and laid off in blocks of approximately 250 acres, which will greatly facilitate the present and future working of them. An adequate system of fire-breaks has been put into effect throughout the whole of the forest reserve. Clearing operations on a block of the new area are well advanced, approximately 140 acres of scrub being felled, and all firewood saved for the use of employees in camp. The procuration of efficient workmen during the pitting and planting periods gave some trouble, but ultimately a fair gang was obtained. The rabbit pest, which is ever before us in this district, was kept in check by trapping and poisoning. It is proposed to plant from 800,000 to 1,000,000 trees during the coming season should the necessary labour be available.

The average number of men employed during the year was 9·77.

The expenditure during the year amounted to £5,428 8s. 9d., and total to date £7,471 11s. 2d.

Acreages of Trees planted.

Name of Tree.	Area.	
	Pure.	Mixed.
	Acres.	Acres.
Pinus Laricio	55	..
,, *ponderosa*	121	..
,, *Benthamiana*	1½	..
,, *radiata*	33	..
,, *austriaca*	219	..
,, *muricata*	7½	..
,, *pinaster*	2½	..
,, *ponderosa* var. *scopulorum*	3	..
Pseudo-tsuga taxifolia	10	..
Betula alba	¼	..
Populus deltoides	¼	..
,, *fastigiata*	3	..
Totals	456	..
	456	

PART II.—NATIVE FORESTS.

(By E. Phillips Turner, F.R.G.S.)

Output from Mills.

At the present time the output of timber by the different mills cannot be satisfactorily obtained; approximations, however, are got by either personal inquiries made at the mills by departmental rangers or by application to sawmillers' associations. As far as could be ascertained, the total output for the year was 247,980,000 superficial feet, being 104,520,000 ft. less than for the previous year. Of the total production the Auckland Land District produced 87,165,516 ft., Wellington 69,120,000 ft., Westland 46,760,100 ft., and Southland 20,000,000 ft. In Canterbury there were about 1,000,000 sup. ft. of *Pinus radiata* and *Eucalyptus* timber milled, but practically no native timber, supplies of this last being obtained from other districts. The output of kauri was 20,890,359 sup. ft. Slackness in the building trade, scarcity of labour, shortage of tonnage for export, and other war conditions have all had an influence in lessening production.

Export of Native Timbers.

The return furnished by the Comptroller of Customs shows the total export of native timber to have been 70,747,737 sup. ft., which is 6,768,119 sup. ft. less than for the previous year. The total value of the native timber and bark (28 tons, valued at £462) exported was £419,884. Owing to the fact that the war has made it impossible for Australia to get her ordinary supplies of softwoods from America and the Baltic, there has been a keen demand for New Zealand softwoods by Australian merchants. White-pine and kauri are the chief timbers exported, but the export of rimu is increasing. There is also a small export of Southland beech (*Nothofagus Menziesii*) to Australia, and it is probable that after the war a good market for this timber will be found there—that is, if our own requirements do not necessitate action of a restrictive nature.

Imports of Timber.

The amount of timber imported during the year was (excluding laths, rails, posts, and shingles) 12,864,363 sup. ft., including 3,171,473 sup. ft. of Oregon pine, which was 6,247,927 sup. ft. less than for the previous year. The total value of all timber imported was £139,095, being £51,808 less than for the previous year. The quantity of tan bark imported was 4,426 tons, valued at £46,480. In 1913 the quantity of timber imported was 46,907,877 sup. ft., which, together with round logs, laths, rails, posts, &c., was valued at £504,882. This big drop in imports is probably due solely to the effect of the war.

Revenue received from Royalties and Sales of Native Timber.

The revenue received during the year as royalties and rents from State forests was £10,536 13s. 1d., which was paid into the State Forests Account. The revenue received from licenses and sales of timber on national-endowment lands was £13,531. The revenue received from timber licenses and sales of timber on Crown lands was £10,063. The total of above amounts was £34,130 13s. 1d. These receipts have been credited to National Endowment Account and Territorial Revenue respectively, and were not available for forestry purposes. The total for the previous year was £32,247.

Increase in Prices of Timber.

The prices given below are merchants' prices at Wellington, and it will be seen that there has been a considerable rise over the price for 1917. The rise is attributed mainly to increased wages that have to be paid for labour in the bush and in the mills, and to increased cost of machinery, wire rope, belting, oils, &c. The increased value that our ordinary building timbers have reached will tend to cause more care in the logging and milling operations, and in this way will lessen waste; higher values will also increase the use of some of the timbers that are at present milled only to a very limited extent.

Price per 100 Superficial Feet.

	1909.		1917.		1918.	
	Ordinary Building.	Clean Heart.	Ordinary Building.	Clean Heart.	Ordinary Building.	Clean Heart.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Rimu	14 6	24 0	16 0	35 0	18 6	40 0
White-pine	13 6	..	16 6	..	21 6*	..
Matai	..	22 6	..	33 0	..	39 0
Kauri	..	29 6	..	43 0	..	48 0

* Clean sap white-pine suitable for butter-boxes and cooperage is 23s. 6d. per 100 sup. ft.

Though the above figures show that even in this Dominion there has been since 1909 a large rise in the value of timber, it is nevertheless small when compared with the rise that has taken place in the United Kingdom, for there the average value of 10,204,000 loads (which was the average amount of wood and timber, not counting products of wood) annually imported between 1909 and 1913 was £27,561,421; in 1915 the imports had dropped to 7,668,000 loads, but the value had risen to £32,788,324; whilst in 1916 the imports had dropped to 6,319,000 loads, and the value soared to £40,199,469. In January, 1913, 3 in. by 9 in. second Archangel white-spruce was 1s. 9d. per cubic foot, whilst in December of 1917 the price of the same material was 6s. 2d. per cubic foot, or £2 11s. 6d. per 100 ft. superficial for a timber inferior to our ordinary building-rimu.

Increasing Importance of Timber.

In a report of the Reconstruction Committee (Forestry Sub-Committee) of the Ministry of Reconstruction (London, 1918) it is stated that there has been a steady rise in the price of timber since 1865. Between the years 1895 and 1913 there was a large increase in the United Kingdom in the consumption of coniferous timber and an increase in price of one-third. No substitute has been found for coniferous timber, which every year, either as timber or as pulp, is being used for new purposes throughout the world. Great Britain's ability to carry on the war has been due to the vast supplies of timber which have been imported from abroad. Timber has proved to be absolutely essential for the rapid construction of war works. The War Office alone in one year consumed 1,200,000,000 sup. ft. Through neglect to grow her own supplies Britain during the war has had to get her supplies from abroad. In doing this 13 per cent. of the total shipping was employed, which was more than the tonnage used for grain imports. The ships

that carried the timber were largely foreign-owned, and the return freight was coal. Britain was therefore paying to foreigners a much enhanced price for the timber, and was hampered by having to mine coal for them; furthermore, the foreigner got the advantage of the increased freights. The report shows that America and Canada are now taking measures to bring their annual cut into conformity with the natural annual increment of their forests, and that the development that is likely to take place in Russia after the war will probably lessen the amount that that country has previously had for export. The Committee therefore recommended that the British Government should at once start extensive afforestation on the large area of poor lands in Great Britain and Ireland, and that at the same time (as it will be several years before there will be a substantial return from the afforested area) the Government should endeavour to arrange for its use a large area of forest in a British dominion or in a friendly country. "It may be argued that there may be such revolutions in industrial processes that wood will become unnecessary, both in war and in peace; there may be such a revolution in human nature that wars or trade boycotts between nations will become inconsiderable. There may be climatic or other natural changes which will either make the areas that are now afforestable unsuited for timber-growing or less valuable to the State for timber than for some other purpose which as yet we cannot imagine. We regard all these possibilities as very unlikely to happen in forty years, and we therefore cannot too strongly emphasize our conviction of the necessity for steady progress upon a definite plan for at least that time." There is still a large proportion of the population of this Dominion who (mainly from want of thought) are indifferent to the question of our timber-supplies, or who, though admitting the necessity of the use of timber, think our future supplies can easily be procured from abroad. Consideration of the foregoing should convince them that a *laissez-faire* policy is dangerous, and that true patriotism, concerning itself more with the future of the country than with the present, demands the application of such measures as will ensure a sustained supply for ourselves and those that will succeed us.

Forest By-products and Research.

In America and Europe the war has stimulated research in connection with products from wood. Methods have been discovered by which alcohol for motor and other purposes can be profitably distilled from wood. Alcohol is now being obtained from the waste liquors of pulp-manufacture. Wood-flour is being largely made; it is used in the manufacture of dynamite, linoleum, wall-paper, wood plastics, and in Germany is used in admixture with ordinary flour from grain for human food. Our command of the sea has deprived Germany of her supplies of cotton, and that country is said to be using cellulose from wood as a substitute for it in the manufacture of her explosives. Numerous articles of clothing are now made from wood-pulp. By a subtle process the silkworm makes silk from the leaves of certain trees; by a chemical process man is now making silk from wood-pulp. In the United States one manufacturer of pulp building-board alone used 300,000,000 ft. of timber.

In this Dominion, at Palmerston North, a syndicate has started a plant for the distillation of spirit, oils, &c., from wood, and it is to be hoped that their enterprise will meet with success. Mr. B. C. Aston, Chief Chemist of the Agricultural Department, has during the year made investigations with respect to the dyes obtainable from plants of the genus *Coprosma*, and has also determined the tannin-contents of the barks and timbers of various indigenous forest-trees. As a result of his experiments it will probably be found profitable in the milling of our beeches to bark the logs and prepare from the bark a tannin extract.

In America portable distilling plants are used in the long-leaf pine (pitch-pine) forests of the southern States for the extraction of oils and resin from the stumps. There seems no reason why such a plant could not be successfully operated in a kauri forest, as the kauri resin would have a higher value than that obtained from the pitch-pine.

With the increasing importance of forest industries there is already abundant work for a special research officer, and antiseptic treatment, prevention of sap-stain, artificial seasoning, diseases of native trees, volume-increment of native trees, strengths, &c., are some of the many important matters awaiting investigation. Mr. Stanton Hicks, M.Sc., has carried out some interesting laboratory experiments in the fireproofing and antiseptic treatment of rimu, white-pine, and some of our beeches, and the results of his experiments are shortly to be published. It is to be hoped that he will be able to continue an investigation so important to the future of forestry in this country.

New Uses for Native Timbers.

There is little doubt that as kauri, rimu, matai, white-pine, &c., became scarcer, tawa, the beeches, taraire, &c., will be largely used. The chief defect of the beeches is the difficulty of seasoning them, but when seasoned they are certainly very fine timbers. The use of Southland beech for furniture is on the increase, and it is claimed that it has been successfully tested for butter-boxes. The very high price of iron should have made a market for our mountain-cedar (kahikawaka), for this timber makes an excellent shingle—it is light, durable, easily split or sawn, and is a very bad burning timber. It would also be most suitable for cutting into plaster-laths and venetian-blind slats. Even before the war had caused the rise in iron the Canadians and Americans largely used shingles. The scarcity of coal and its excessively high price must have made many people wonder why wood is not more used for fuel in this Dominion. In Canada, as a war measure, coal is being reserved for the requirements of the railways, factories, steamers, &c., and the use of wood fuel has become a necessity. Of late probably many people in this Dominion have wondered why high-priced coal, often difficult to obtain, is practically the only fuel—at least for town dwellers. The calorific value of American birch when dry is rather more than half that of an equal weight of anthracite coal. I am not aware that the calorific values of our woods have been properly tested, but I think it may be safely assumed that rata, maire, and manuka are superior to American birch, and that tawa and matai are about equal to it; or, say, the average native hardwood is equal to rather more than half its weight of our best

coal. Seeing, then, that most of our large towns have timbered lands close to them, it seems strange that people use wood fuel so little. The taking of wood fuel from a forest would not, of course, destroy the forest, for under proper management its perpetuity could be ensured.

Forest Fires.

It is satisfactory to state that though last summer was very dry no milling forest was damaged to any serious extent; however, a very serious fire that started in the Raetihi farming areas spread so rapidly during a cyclonic storm that, in addition to several settlers' houses, nine timber-mills were destroyed. A fire that was started by lightning in the Dusky Hill Plantation during a thunderstorm, being soon discovered, was put out before any considerable damage was done. People in this Dominion are undoubtedly very careless in the matter of fires. In former years settlement was scattered, and forests by most people were considered to be too plentiful. Under such circumstances people set fire to felled bush, scrub, or fern, and never bothered to consider where the fire would end. Milling forest has now become scarce and more valuable, whilst settlement has extended. It is time, therefore, that this indifference as to fires should be checked, and it may be advisable to introduce some of the restrictive measures with regard to firing that are in force in Canada and the United States. Both those countries employ large staffs of men as fire rangers to protect their forests. Look-out stations, which are connected by telephone, are built in the forest, and should a fire occur assistance is at once procurable. The rangers have motor-boats on the lakes and rivers, gasoline fire-pumps, and apparatus for tapping the telephone-wires. They have the power of special constables, and may call on any civilians to help them in putting out fires. In Canada after the war it is proposed to employ airplanes in connection with forest-protection. The different Provincial Governments spend considerable sums in erecting conspicuous placards which set out the commercial and other values of forest to a country, and which quote the number of lives lost and the property that has been destroyed in previous years; people are taught that fire is their enemy, and that it is easily prevented, but difficult to overcome when started. It is considered that money spent on fire-ranging is merely an insurance of the forest.

Forest Pests.

For the purposes of sport in this country there have been introduced various animals, some of which are now threatening to become serious pests. The opossum eats the berries and seedlings of many trees, and where these animals are abundant they would have an appreciably deterrent effect on natural regeneration. They yield, however, valuable skins, and as they are easily trapped the damage they do may be compensated for by the return from the skins. A more serious pest are imported deer. These animals afford a good sport, no doubt, but it is enjoyed by a very limited number of people, and the animals yield no revenue worth speaking of. On the other hand, they are becoming a serious nuisance in our artificial plantations, and where present in our native forest they destroy a large amount of young growth—in fact, if not kept down they will entirely prevent regeneration of the forest, as Professor Somerville has proved they have done in Scotland.

In my travels through the Dominion I have observed in many places that many varieties of imported trees are being attacked by fungoid and insect pests. Even the vigorous *Pinus radiata* is frequently seen affected with a leaf-shedding disease (caused by a minute fungus); the disease from which the valuable *Cupressus macrocarpa* suffers is seen from north to south; the silver-wattle is often defoliated by a small fly; and many of the gums are seriously affected with a scale insect; chestnut and other trees are also seen affected by disease. Seeing that an increasing amount of money is being invested by the State, local bodies, and private persons in tree plantations, it seems advisable that some action should be taken to institute measures for the control or prevention of forest-tree pests. Most valuable forests of Weymouth pine in Europe and America have been ruined by a blister-rust. As the black currant and gooseberry and their relations are the intermediate hosts for this rust, all these plants should be prohibited from being imported into New Zealand.

New Forest Reservations and Withdrawals from Reservations.

During the year a total area of 9,496 acres was proclaimed State forest, and 3,724 acres were withdrawn from reservation for the purposes of settlement.

Aproximate Amounts of Output of Timber for the Year 1917–18, as obtained from Reports of the Commissioners of Crown Lands.

Provincial District.	Kauri.	Rimu (Red-pine).	Kahikatea (White-pine).	Matai (Black-pine).	Totara.	Beech.	Tawa.	Miscellaneous.
	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.
Auckland ..	20,890,359	24,494,401	23,251,524	5,194,579	11,916,123	..	..	1,412,001
Taranaki ..	..	2,600,000	..	..	..	..	..	900,000
Hawke's Ba ..	..	4,039,200	1,235,500	..	..	..	..	175,300
Wellington ..	..	..	..	..	..	..	..	69,120,000*
Marlborough ..	..	2,374,200	1,189,100	192,100	11,940	59,400	..	..
Nelson ..	..	3,893,100	..	..	..	762,100	..	9,100
Westland ..	..	38,360,100	8,000,000	..	..	400,000	..	..
Canterbury ..	..	..	..	..	..	..	..	1,000,000
Otago ..	..	2,200,000	82,500	550,000	82,500	1,485,000	..	1,100,000
Southland ..	..	13,000,000	4,000,000	500,000	300,000	2,160,000	..	40,000
Totals ..	20,890,359	90,961,001	37,758,624	6,436,679	12,310,563	4,866,500	..	74,756,401

* Amounts of each separate kind could not be obtained; probably 70 per cent. rimu.

RETURN FURNISHED BY THE COMPTROLLER OF CUSTOMS SHOWING THE TOTAL QUANTITY AND VALUE OF THE UNDERMENTIONED KINDS OF TIMBER IMPORTED INTO NEW ZEALAND AND THE NET CUSTOMS DUTY COLLECTED ON TIMBER DURING THE YEAR ENDED 31ST MARCH, 1918.

Heading.	Quantity.	Net Duty collected.*	Value.
	Sup. Feet.	£	£
Round logs—			
Ironbark	543,789	36	8,046
Other timbers	107,977	8	1,119
Hewn logs—			
Ironbark	1,972,182	147	28,102
Jarrah	459	..	7
Other timbers	1,814,494	37	20,122
Sawn rough—			
Ironbark	420,163	356	5,926
Jarrah	2,344,607	716	26,167
Oregon pine (Canada)	20,248	21	114
Oregon pine (U.S.A.)	3,151,225	3,277	14,744
Other timbers	2,489,219	2,625	29,217
Total	12,864,363		
Sawn, dressed: Miscellaneous	44,917	62	905
	Number.		
Laths	1,381,080	154	974
Palings, split	103,485	98	742
Rails, split	..	..	..
Posts, split	450	2	10
Shingles	475,023	57	955
Miscellaneous	..	18	1,945
	Tons.		
Tanning-bark	4,426	460	46,480
Totals	..	8,074	185,575

* Including primage duty, 1 per cent. *ad valorem*.

RETURN FURNISHED BY THE COMPTROLLER OF CUSTOMS SHOWING THE TOTAL QUANTITY AND VALUE OF THE UNDERMENTIONED KINDS OF TIMBER EXPORTED FROM NEW ZEALAND AND THE TIMBER EXPORT DUTY COLLECTED DURING THE YEAR ENDED 31ST MARCH, 1918.

Heading.	Quantity.	Duty collected.	Value.
	Sup. Feet.	£ s. d.	£
Kauri	12,649,247	4 12 1	100,966
Kahikatea (white-pine)	32,225,935	..	184,146
Rimu (red-pine)	24,987,421	..	128,054
Beech (birches)	510,069	..	3,346
Miscellaneous (New Zealand)	375,037	..	2,692
,, (not New Zealand)	20,519	..	218
Tanning-bark (New Zealand)	28 tons	..	462
,, (not New Zealand)	..	..	..
		4 12 1	419,884

EXTRACTS FROM REPORTS BY THE COMMISSIONERS OF CROWN LANDS.

AUCKLAND.

(H. M. Skeet, Commissioner of Crown Lands.)

Very little change has taken place during the past year in the general conditions of the timber industry in the Auckland Land District, with the exception perhaps of the difficulty of contending with the shortage of skilled bush labour, resulting in a decrease of log-production. Both the local and intercolonial demands for sawn timber of all kinds still remain firm, and keen inquiries have been made by New Zealand and Australian representatives for prospective purchases of standing forests for future supplies, and in expectancy of heavy demands for timber after the war. Considerable public interest has been manifest in discussing the important question of the conservation of the New Zealand timbers, more especially as regards kahikatea (white-pine), which is fast becoming scarce. Large quantities of this timber are still being exported from the Northern Wairoa, and in some cases it is expected that shortly in this district

a number of sawmills will be required to close down through exhaustion of supplies of white-pine. From inquiries made it has been ascertained that, with the exception of an additional one or two minor sawmills, the number of mills in operation in this district, and hands employed, and the output of sawn timber, are practically the same as last year's return.

Prices for sawn timber of various kinds, with the exception of kauri timber, have very considerably advanced, and no less than three successive rises in prices have taken place during the year, and a contemplated further advance has recently been reported. The following is a comparison of increase in prices in one line alone of heart timber in various kinds :—

	Rimu.	Matai.	Totara.
April, 1917	28s.	25s	29s.
April, 1918	38s.	33s.	40s.

Attention is being given to the utilization of *Pinus radiata* for box-making, and there is now quite a demand for these trees growing within reach of the Waitemata Harbour.

The Forest Caretakers report that with the strict watch exercised the Crown kauri forests have been kept free from gum thieves and trespassers, and only on one or two occasions has there been any evidence of game-shooting taking place in these forests. All Crown forests have been immune from fires during the year.

The following table shows in superficial feet the various kinds of timber disposed of during the year ended 31st March, 1918 :—

——	Kauri.	Rimu.	Kahikatea.	Totara.	Matai.	Miscellaneous.	Total.	Amount realized.
								£ s. d.
Crown lands and lands for settlement	283,522	327,713	103,741	129,115	63,685	486,929	1,394,705	876 1 2
Education reserves ..	90,174	10,000	22,000	..	..	..	122,174	76 0 0
State forests	..	127,832	59,921	2,000	..	8,165	197,918	93 0 0
Totals	373,696	465,545	185,662	131,115	63,685	495,094	1,714,797	1,045 1 2

The total amounts received as timber royalties and for extensions of time for removal of timber during the year were as follows: Crown lands, £1,094 16s.; State forests, £5,284 18s.; national-endowment lands, £3,715 18s. 6d.; lands for settlement, £60 18s. 4d.: total, £10,156 10s. 10d.

Timber-floating Licenses.—Renewals were granted for ninety-nine licenses, and six new licenses issued.

Three parties of timber-measurers were engaged in measuring and inspecting timber, and the total quantities of all kinds of timber measured was about 26,911,523 sup. ft., at an average cost of 1·042d. per 100 sup. ft.

Taranaki.

(G. H. Bullard, Commissioner of Crown Lands.)

Anything I can report is very much on the lines of last year's statement so far as this district is concerned. The general condition of the timber industry in Taranaki is good excepting for shortage of labour.

As far as I know, there are about seven small mills working in different parts of the district, five of which are drawing part of their supplies from Crown land. Another large mill is located in this land district, but the timber converted actually comes from the Auckland Land District. I estimate the output of timber at 3,500,000 ft.—rimu, 2,600,000 ft.; white-pine and totara, 300,000 ft.; matai, &c., only in small quantity.

The royalties and rents received at this office for the past year are as follows: State forests, £6 5s.; licenses and sales from national endowment, £1,306 19s. 11d.; licenses and sales from Crown lands, £796 9s. 1d.

The net wholesale prices per 100 sup. ft. for ordinary building and clean heart charged by timber-merchants in New Plymouth are as follows:—O.B. rimu (seasoned): Scantling, 21s. 6d.; boards and planks, 9 in. to 12 in. wide, 22s. 6d. to 23s. 6d.; clean O.B. planks and boards, 9 in. to 12 in. wide, 24s. 6d. to 25s. 6d.; rough lining, 20s. 6d. Heart rimu: Building heart scantling, 23s. 6d.; rough heart scantling, 19s. 6d.; dressing heart up to 9 in. wide, 32s. 6d.; dressing heart up to 12 in. wide, 41s. 6d.; clean heart for joinery, 9 in. to 12 in., 40s. 6d. to 41s. 6d. Totara: O.B. totara and scantling to 12 in. wide, 28s. 6d.; building heart, 40s. 6d.; dressing heart, 45s. 6d. White-pine: O.B. boards and scantling to 12 in. wide, 19s. 6d.; second class, 14s. 6d.; clean O.B., 21s. 6d.

I think ten years will see very little milling-timber left in these parts, but I am having a rough estimate made of the timber on about 4,000 acres in the Waro Survey District, and, if up to expectations, supplies there may last longer.

No fresh timbers are coming into use, but tawa may come in for box and case timber. No area has been destroyed by fire during the past year in Taranaki. I think the question of resuming some of the poorer land along the Main Trunk line, about such localities as Waimiha, for the purposes of State forestry should receive earnest attention from the Government. Much of the land in question is poor at the best for agriculture or grazing, but should do for forestry purposes, as being handy to a railway and consisting of country not very difficult to road for the purpose of working timber.

Hawke's Bay.

(W. F. Marsh, Commissioner of Crown Lands.)

As regards that portion of Hawke's Bay District extending from the Mohaka River on the north to Woodville on the south, all the milling-timber is practically cut out.

There are only four mills now remaining—viz., R. Holt and Son, Puketitiri; Bull Bros., "Henley," Patoka; Burgess, Ongaonga (small plant), and Tangarewa (small plant) also run by Burgess. The mills are not working constantly, and the output for the year may be put down at 500,000 ft. of rimu and 100,000 ft. of white-pine, being an average monthly output of 50,000 ft.

Prices: O.B. rimu, 16s. 6d.; clean heart, 30s. Totara, clean heart, 40s. White-pine at rates for rimu.

Owing to the present condition of the trade, supplies may last another four to five years. I am unable to obtain other than a rough estimate. If the trade became brisk after the war supplies might be exhausted in a shorter period.

Poplar from wind-breaks is now being used for butter-boxes, and is taking the place of white-pine to some extent; and at the present time rata, matai, and maire are of considerable commercial value as firewood.

There have been practically no fires, owing to the wet seasons experienced in this district.

Sawmilling as an industry is fast becoming a feature of the past, and at the present time there is very little business doing in the trade.

As regards the northern portion of this district, it may be said that the general conditions of the milling industry have been very similar to last year; but the sales are easing off now for all timbers except white-pine, for which there is a good demand for export.

The demand for timber has been steady. Although there is practically nothing doing in the way of house-construction in town, there have been quite a number of wool-stores erected, as well as extra storage-room for the various freezing-works. There has also been a fairly good country trade; but the prospects for the sale of timber locally during the winter are not too bright, as, owing to the continuous wet weather, the carting on the country roads is uncertain. As the majority of the men employed are married men and in the Second Division, the war has not yet affected the labour question seriously.

On account of the very high price paid for labour and all other milling requisites, especially wire rope for log-hauling purposes, the sawmillers advanced the price of timber about 10 per cent. from the 1st July, 1917.

The wages now paid are from 13s. per diem for mill hands to 16s. for bushmen, being an average of close on 15s. all round.

There are at present four mills working at Motu, and one small mill at Te Karaka, cutting white-pine. Since my last report one of the Motu mills has been shifted and re-erected at Motuhora Station, and has now a cutting-capacity of 10,000 sup. ft. per day. As it has taken practically the whole year to shift and re-erect, this mill has only cut about 100,000 sup. ft., except timber for its own use.

The total output for the year is 4,850,000 sup. ft., comprising 3,539,169 sup. ft. rimu, 1,135,515 sup. ft. white-pine, and 175,316 sup. ft. matai, birch, and totara.

Re net wholesale prices at present charged by timber-merchants, I am attaching one of the merchant's price-lists. They allow 10 per cent. discount to builders. The timber delivered in the yards cost the merchants as follows, per 100 sup. ft., less 10 per cent. discount: Clean heart of rimu, 29s.; ordinary building rimu, 16s.; clean heart of matai, 30s.; clean heart of white-pine, 18s.; ordinary building white-pine, 15s.

The probable duration of different milling-timbers now used is, at the present rate of cutting, about thirteen years.

No new timbers have come into use in this district.

No timber of any value has been destroyed by fire in this district.

Wellington.

(G. H. M. McClure, Commissioner of Crown Lands.)

A ready sale has been found for all classes of timber, and the industry is generally in a good condition. The millers are, of course, very greatly handicapped by the shortage of expert labour and the high cost of materials required in running the mills, thereby reducing the output. The wages of bushmen average 15s. per day, and a good benchman can command up to £25 per month, with a free house.

Prior to the disastrous bush-fires which occurred recently in the Raetihi and surrounding districts there were forty-two mills operating on Crown, Native, and private lands, principally along the Main Trunk Railway north of Taihape, having an output of 5,760,000 sup. ft. per month. Nine of these mills were destroyed, their output being 1,115,000 sup. ft. per month, and some of these will not be rebuilt, as the owners had almost completed milling.

As the millers dispose of so much of their stock as mixed timber, it is impossible to ascertain the correct or approximate quantities of each class of timber cut; it is principally rimu, matai, and kahikatea, with a little totara.

No special cutting has been done in New Zealand timbers outside the ordinary lines of stock. An estimate of the period during which timber-supplies will be available at the present rate of cutting is about ten years in the more southern districts, while those in the northern part of the

district may last for twenty years. During the year the amount of royalty received from sales of timber was as follows: From timber cut on Crown lands, £5,090; State forests, £54; national endowments, £89: total, £5,233.

During March this year a cyclonic storm visited this Island and caused a certain amount of damage to the unmilled forests (more especially on the outskirts) in the Horopito, Raetihi, and Ohakune districts, much of the timber being blown down. The bush-fires which accompanied the storm did not appreciably affect the standing timber on Crown lands, only small areas scattered through the fire zone being destroyed, possibly about 100 acres in all. No other damage is reported from other parts of the district.

The felling of bush left by millers and clearing up those areas by burning and sowing grass-seed is also urged, as the neglect in these matters is considered to have contributed to the recent disaster referred to above.

Marlborough.

(H. D. McKellar, Commissioner of Crown Lands.)

The demand for timber is greater than the supply. Experienced labour is difficult to obtain, and war conditions generally are hampering the output.

Seven sawmills are operating in the district, with an output of 3,826,822 ft., comprising 2,374,247 ft. rimu, 1,189,118 ft. kahikatea, 192,087 ft. matai, 59,432 ft. birch, 11,938 ft. totara. Five mills are operating on royalty bases on Crown lands and State forests, and one on straight-out sales of timber on Crown lands and whatever private timber can be purchased. The remaining mill works private lands. Two licenses were surrendered during the year, one of which had not cut any timber during the period. The output mentioned is from the mills operating Crown and State forest lands on royalty basis.

Royalties.—State forests (2,523,629 ft.), £1,119 12s. 8d.; licenses and sales of timber from national-endowment lands, nil; licenses and sales of 1,304,193 ft. timber from Crown lands, £354 18s. 1d.: total, £1,474 10s. 9d.

The net wholesale prices per 100 sup. ft. at the mill are as follows: Rimu—Rough hewing, O.B., and sarking, 14s. 6d.; clean, 16s.; heart, 19s. Birch, 25s. 6d. Matai—Rough heart, 23s.; clean, 25s. White-pine, 13s.

Some of the softer timbers are now being utilized to make wood-wool, largely used for fruit-packing in the Nelson District.

No forests have been destroyed by fire during the past year.

War conditions generally, with scarcity of competent labour, the abnormal increase in the cost of machinery, and increasing inaccessibility of milling-timber, are having a deterrent effect on the output in this district.

I might quote here the local retail prices of timber per 100 sup. ft. to the public: Rimu—Rough hewing, 18s. 6d.; O.B. and sarking, 19s. 6d.; clean for dressing, 8 in. to 12 in., 21s. 6d. to 24s.; T. and G. rusticated, 25s. 6d. Birch, 31s. 6d. Matai—Rough heart, 26s.; clean heart, 28s. White-pine, 1s. 6d. less than rimu. Totara, not quoted; very scarce and difficult to obtain.

Nelson.

(F. A. Thompson, Commissioner of Crown Lands.)

In this district conditions vary somewhat in different localities, and it will be found advisable to consider the question as it relates to the following three portions of the district—the northern portion, and the Reefton and Buller portions.

In the northern portion the industry is practically finished on Crown lands, and the cutting is almost all confined to freehold, and even the areas thereon available are comparatively small and scattered. It is estimated, therefore, that for the more valuable kinds of timber, such as rimu, totara, matai, and kahikatea, cutting, at the present average rate, can hardly last more than four or five years.

There will still remain a very considerable area of good birch, both black and brown; but at present birch, of which the supply is practically inexhaustible at the present rate of output, is not much in demand, and timber of the better classes is being brought here from Pelorus Valley, either by sea or by wagoning, for conversion.

The increasing inaccessibility and difficulty of marketing such timbers as remain, combined with conditions prevailing on account of the war, render milling operations in this locality very unsatisfactory.

There are twenty-four mills in active operation, but on the whole the industry is not in a very flourishing condition. It is not possible to obtain a complete statement of the output from mills working on private lands.

There was no destruction of millable timber by fires during the year.

In the Reefton district seven mills are carrying on active operations, almost wholly on Crown lands. The ascertained output was 2,201,768 ft., comprising the following timber: Rimu, 1,503,598 ft.; birch, 689,076 ft.; silver-pine, 6,244 ft.; and kaikawaka, 2,850 ft.

The more valuable timbers, such as rimu, it is estimated, will not stand more than fourteen or fifteen years' milling, but the birches, as in other parts of the district, will last very much longer. No new timbers are being utilized so far.

During the year no bush-fires were experienced, and consequently no milling-timber was destroyed.

On the whole, mainly owing to the supply giving out, and also in some measure to shortage of labour on account of war conditions, the industry has shown a decline during the past year.

In the Buller portion of the district there are seven mills in active operation, but two of these are likely to close down very shortly owing to scarcity of labour and shipping.

The principal timber being milled is rimu, and it is estimated that there is sufficient of this variety standing to keep the mills running at the present rate of consumption for close on thirty years. Kahikatea is very scarce, and is found only in small patches in the gullies. Black-pine and totara are also very scarce, but the supply of birch is very large on the mountain-slopes.

No milling is going on at Karamea, owing to the uncertain nature of the bar harbour. The output for the year, as far as can be ascertained, was—Rimu, 1,416,033 ft. on Crown lands and 723,471 ft. on private land; birch, 73,068 ft.

There were no bush-fires during the year, and the milling bush did not suffer any damage from that source of danger.

Summary.—General condition of sawmilling industry: Nelson, Reefton, Westport, declining.

Number of sawmills in active work, thirty-eight. Output during year: Rimu, 3,893,102 sup. ft.; birch, 762,144 sup. ft.; silver-pine, 6,244 sup. ft.; kaikawaka, 2,850 sup. ft.: total, 4,664,340 sup. ft.

Royalties, &c., received: From State forests, nil; from timber on Crown lands, £479; from timber on national-endowment lands, £941.

Wholesale prices, per 100 sup. ft., at present charged by merchants: Reefton and Buller—Rimu, 10s. to 20s.; kahikatea, 10s. to 20s.; totara, 30s. 6d.; matai, 26s. 6d.; birch, 18s.; silver-pine posts, 1s. 6d. each. Nelson—Rimu, 16s. to 20s.; kahikatea, 16s. to 20s.; totara, 32s. to 35s.; matai, 20s. to 27s.; birch, 16s. to 20s.; silver-pine, 32s. to 35s.

Approximate duration of present supplies of milling-timber now used: Nelson, five years; Reefton, fifteen years; Westport, thirty years.

Timber formerly rejected but now used: Birches.

Damage by fire: Nil.

Canterbury.

(W. H. Skinner, Commissioner of Crown Lands.)

Native Forests and Timber Matters.—The milling of native timbers, so far as this land district is concerned, is a thing of the past. There is only one sawmilling license in the whole of Canterbury, and that has not been in operation during the past twelve months owing to the indisposition of the licensee. Birch—or, to give the tree its proper name, beech (*Fagus Solandri*)—was extensively used both for dwellings and bridge-building, but the difficulty of access to the remaining forests of this timber has stopped all enterprise in this direction. Its place for bridge-construction has been taken by imported hardwoods, such as jarrah and ironbark, also by reinforced concrete, and in the erection of buildings by redwood, Oregon pine, and Baltic pine. Apart from the inaccessibility of the remaining forests, their destruction would be detrimental to the water-supply of the plains. The one mill mentioned will be active again this year, but its output when in full work does not exceed 1,200 sup. ft. per month.

The royalty received from timber cut on State forests for the year was £17 13s. 6d., and from Crown lands nil.

The present market prices for imported timber are as follows:—From other districts in New Zealand, per 100 sup. ft.: Red-pine (rimu)—Undressed, up to 12 in. wide, 25s. 3d.; over that size, 29s. to 34s.: dressed flooring, 30s. to 33s.; lining, 20s. to 26s.: weatherboards, 24s. 3d. to 29s. 6d.; 12 in. to 18 in., dressed, 30s. 6d. to 38s. (These prices show an increase since 1915 of over 15 per cent.) White-pine (kahikatea)—First-class dressed, according to widths demanded, 26s. 3d. to 32s. 9d.; second class, up to 12 in., 19s. 6d. (20 per cent. increase since 1915). Black-pine (matai)—All heart, up to 12 in., 48s. 6d. (an increase since 1915 of 20 per cent.); 4 in. by 1 in. flooring, 16s. Totara—All heart, up to 12 in., 48s. 6d. (increase since 1915, 60 per cent.); dressed veranda flooring, 4 in. by 1 in., 19s. Kauri—Flitch timber, 12 in. to 24 in. wide, all heart, 51s. 6d. to 63s. 6d.; rough, 12 in. by ½ in. to 18 in., 34s. 6d. to 39s. 6d.; dressed, for the same sizes, 39s. to 44s.: T. and G. flooring, 6½ in. by ⅞ in., 52s. 6d.; 4½ in. by 1 in., 55s.; 6½ in. by 1 in., 54s. (increase since 1915, 16 per cent. to 20 per cent.). Local-grown timbers from exotic trees: *Eucalyptus globulus* (blue-gum), 3 in. by 1 in. and 4 in. by 1 in., 4 in. by 2 in., for gates, hurdles, studding, &c., 7s. to 10s. per 100 running feet. *Pinus radiata*—Weatherboards and scantlings—9 in. by 1 in., 3 in. by 2 in., 4 in. by 2 in., 14s. to 15s. per 100 sup. ft. These timbers are increasing in use. Imported hardwood: Jarrah, 45s. to 50s. (very scanty); ironbark—piles and posts, 3s. 6d. to 4s. per running foot. Tasmanian, 28s. per 100 sup. ft.; palings, 38s. per 100. Softwoods: Redwood, 45s.; yellow-pine, 48s.; and Baltic, 47s. per 100 sup. ft.

The supply of native timber being exhausted, *Pinus radiata* is used locally for building dwellings and sheds. The numerous plantations scattered all over the district contain matured trees which will provide the demand for many years, provided it becomes not too great. There are also many young plantations of *Pinus radiata* and *Pinus ponderosa*, which will mature in due course and afford a future small supply. These timbers are found to answer well if guarded from the vicissitudes of the weather, especially when painted with Stockholm tar. The gum plantations also provide a supply of hardwood for studding and rafters, gates, and hurdles. An estimate of these plantations available for timber has not yet been made.

The production of sawn timber (mainly *Pinus radiata* and blue-gum) from the plantations under the control of the Selwyn Plantation Board already amounts to a million feet, whilst many

thousands of fencing-droppers have been obtained from the same source. These supplies have been drawn mainly from uprooted trees in these reservations, the result of the terrific north-west gales that from time to time sweep the Canterbury Plains.

No forest-fires have been reported during the year.

As the prices of the various timbers, indigenous and imported, have materially increased of recent years, it may be both interesting and useful for a comparative review to record the present prices in Christchurch for other building-materials: Poilite (asbestos sheeting), in sheets 8 ft. by 4 ft., 13s. 6d. each; corrugated iron, £85 per ton (sheets 5 ft. to 8 ft. by 2 ft.); cement, 5s. 3d. per bag (18 bags to the ton); builders' lime, 4s. 8d. per bag (16 bags to the ton); sand, 7s. per cubic yard; bricks, £3 per thousand.

Westland.

(Thomas Brook, Commissioner of Crown Lands.)

The output of sawn timber for the twelve months ending 31st March, 1918, is 3,450,000 ft. less than that for the preceding year. The shortage is due principally to the lack of labour, but operations are also hampered by the difficulty of procuring iron rails and other necessary material. There is good reason for satisfaction with the shipping which was available. There were occasions when some inconvenience was caused by all storage-space at the mills being filled, and one or two mills were compelled to cease work for a short period, but the timely arrival of vessels relieved the position before the trouble became acute. Notwithstanding the difficulties created by war conditions, there has been and is now an exceptionally keen demand for timber areas, all accessible supplies being readily taken up. The better prices now obtained are no doubt responsible for this, and, although the cost of production has increased considerably, the industry is now on a better footing than for many years past.

There are forty-three mills in this district. Three are operating on freehold lands only, four have closed down temporarily, and thirty-six are cutting on Crown land and freehold. Two mills of large cutting-capacity are in course of erection. During the year 46,760,100 ft. of sawn timber were cut and marketed, 35,210,700 ft. being obtained from Crown land and 11,549,400 ft. from freehold. This output comprised 8,000,000 ft. of white-pine, 38,360,100 ft. of rimu, and 400,000 ft. of brown-birch (*Fagus fusca*). There is an increasing demand for the latter, principally for mining purposes and bridge-work, and a limited quantity is used in the manufacture of furniture. Silver-pine sleepers are always in good demand, but they are becoming more and more difficult to procure. No other kinds of timber have been used to any appreciable extent.

There are no State forests in Westland, and, as all timber on Crown lands is cut under the regulations made under authority of the Mining Act, the increased royalties under the Land Act and State Forests Act which came into force last year do not apply here.

The total amount received by this Department in rents and royalties is £8,286 19s. 5d., being £7,524 7s. 11d. from national-endowment lands, £600 8s. 7d. from Crown lands, £152 7s. 9d. from education endowments, and £9 15s. 2d. from other endowments. These sums do not include rents and royalties which are deemed to be goldfields revenue in accordance with the provisions of section 148 (*a*) of the Mining Act, 1908.

At present there is a much improved market for rough timber of short length, and some millers are making the most of the opportunity for reducing waste.

Sales of timber are made under a very wide classification, which varies for each individual market, and the prices vary accordingly, but the following is a fair average for recent sales, f.o.b., Greymouth: Rimu—Clean heart, 18s.; clean, 13s. 6d.; O.B., 9s. 6d. White-pine—Wides (12 in. and over), 15s.; smaller sizes, 8s. 6d. to 10s. 9d.; seconds, 1s. less. The prices for export to Australia are better, and that market has the additional advantage of being able to absorb a large quantity of low-grade timber for which there is little demand in the Dominion.

No timber of commercial value has been destroyed in this district.

Information as to the extent of accessible timber country is very meagre, and guesswork must enter largely into any attempt to estimate the probable duration of supplies. Having now a better knowledge of the district, I believe my last estimate of twenty years is too low, and that thirty years is nearer the mark.

Otago.

(Robert T. Sadd, Commissioner of Crown Lands.)

The timber industry in Otago is in a flourishing condition at present as far as the demand for the output is concerned. The output, though, is somewhat below the possible limit on account of the shortage of labour. With one exception the Otago mills are all working short-handed—in fact, one mill had to close down recently for want of men.

There are ten sawmills working in the district, and the output for the past year was approximately 5,500,000 ft. The total power could put through about double that amount if plenty of labour was available. It is impossible to state with any degree of certainty what is the output of each kind of timber. Red-pine (rimu) is the most prevalent, and therefore occupies the most prominent place in the yearly production. Beech and miro come next in order of quantity, but totara and kahikatea are now very scarce indeed. The following percentages would be the approximate output: Rimu, 40; matai, 10; miro, 20; totara and kahikatea, 1½ each; beech, 27.

The prices of timber per 100 sup. ft. as fixed by the Southland and Otago Co-operative Timber Company are as follows: Red-pine, ½ in. and under, 11s. to 13s.; scantlings, 13s. 6d. to 16s.; heart, 8 in. to 12 in. wide, 18s. 6d. to 21s.; clean heart, 2s. 6d. per 100 ft. extra; weatherboards, 12s. to 19s.; T. and G., 16s. 6d. to 19s.; dressed—½ in. and under, 15s. to 17s. 6d.; over ½ in., 17s. 6d. to 20s. Black-pine (matai), up to 8 in., 18s. 6d. to 23s.; T. and G. flooring, 26s. 6d. Totara, up to 8 in., 23s.; up to 8 in., all heart, 29s. Beech for building, 1s. per 100 ft. less than red-pine; beech other than for building, same price as red-pine.

The royalties and rents received for the year ended 31st March, 1918, were as follows: State forests, £130 4s. 11d. Licenses and sales of timber from national-endowment lands, nil. Licenses and sales of timber from Crown lands, £249 0s. 3d.

At the present rate of output the timber-supplies in Otago should last from twenty to twenty-five years.

For many years the beech was not looked upon with much favour by Otago millers, but in later times it is being very freely used. The demand for it has largely increased, and the uses to which it is being put have multiplied.

There has not been any standing bush destroyed in Otago during the last year; in fact, it is very rare for the standing bush to take fire.

Efforts are being made to open up an extensive timber trade between the Bluff and Australian ports. Towards the end of the year one steamer sailed with 750,000 ft., and others are expected at regular periods during the early part of the coming year. This trade, if development is successful, is going to take away a considerable amount of our best timbers, much to our loss if we consider the future.

SOUTHLAND.

(H. D. M. Haszard, Commissioner of Crown Lands.)

Owing to the high cost of building-material, shortage of labour, &c., due to the war, the Southland sawmillers have generally experienced a trying year. The Marlborough Timber Company at Mussel Beach, Rowallan, has, however, in the face of it all, been busy in developing works, and have spent a large sum in equipment and providing facilities for shipping its timber. Fair progress has been made in construction of breakwater and wharf, machinery capable of shifting stone 24 tons in weight being employed. Several houses have already been built of a superior class to usual sawmill tenements, whilst a contract has, I believe, been let for building about two dozen more superior five-roomed cottages for married men, which will be provided with hot- and cold-water systems. A public hall is contemplated; also a school and recreation-ground is being provided for. This embryo township is all being laid out on systematic lines, and credit is due to the company for their forethought and enterprise, which is deserving of every success. They have already one small mill in operation, and are erecting a large mill with the idea of exporting their timber direct to Australia or elsewhere in their own steamers. Their system of log-haulage to the mill is mainly by a system of overhead cables, after the standing bush and scrub has been cut down, thus making a clean sweep of everything, which when burnt will ensure a good take of surface-sown grass, the land being of good quality, upon which stock will be grazed, &c.

The timber industry generally is in a very depressed state owing to shipping and men being difficult to obtain, due to the war.

Thirty-eight mills out of forty-seven worked more or less, but none full-handed—mostly single-handed—*i.e.*, three days per week. The output of timber this year, about 20,000,000 ft., is the least for thirty years, and comprised the following timbers: Red-pine and miro, 13,000,000—65 per cent.; white-pine, 4,000,000—20 per cent.; beech, 2,160,000—10·8 per cent.; black-pine, 500,000—2·5 per cent.; totara, 300,000—1·5 per cent.; rata, 40,000—0·2 per cent.

Royalties from State forests amount to £1,794; from national endowment, nil; from Crown lands, £1,724: total, £3,518.

Duration of each class of timber at present rate of supply, which must be necessarily only approximate, but will probably actually prove less as the demand for timber in Southland increases: Red-pine and miro, twenty-eight years; white-pine, sixteen years; beech, ninety years; black-pine and totara, forty-five years.

The brown-beech is now being used, although considered of little value some years ago, and rata is also being utilized to a limited extent.

There was no destruction by fire this year.

Generally speaking, the Southland forests and timber industry are carefully attended to, but there is no doubt that the market price of sawn timber is rising rapidly, even in Southland, due to increased cost of production, &c.

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