1917.

NEW ZEALAND.

DEPARTMENT OF LANDS AND SURVEY:

STATE FORESTRY.

REPORT FOR THE YEAR ENDED 31ST MARCH, 1917.

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

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REPORT.

The Under-Secretary for Lands to the Commissioner of State Forests.

Sir,— Department of Lands and Survey, Wellington, 21st June, 1917.

I have the honour to submit herewith the annual report of the Forestry Branch of this Department. As the report deals this year more fully with our Native forests than previously it has been divided into Part I (State Nurseries and Plantations) and Part II (Native Forests). Tables are appended showing the receipts and expenditure, the imports and exports of timber, for the year ended 31st March, 1917, also the amount of timber cut during the year ended 31st March, 1916.

I have, &c.,

T. N. Brodrick, Under-Secretary.

The Right Hon. W. F. Massey, P.C., Commissioner of State Forests.

PART I.—STATE NURSERIES AND PLANTATIONS.

Trees raised and Area planted.

During the year ended 31st March, 1917, 5,848,930 trees were raised at the four State nurseries, and during the same period 5,419,569 trees were sent out to the various State plantations and 314,467 to outside places.

In the eight plantations where there was still planting-land available a total area of 2,764 acres was planted. The total area planted to date since the start of operations in 1896 is now 29,992 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.	Total Area.
	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	20,159
South Island ..	3,291	891	1,025	902	828	537	749	764	846	9,833
Total ..	11,093	2,698	2,600	2,566	1,604	1,825	2,165	2,677	2,764	29,992

Prison Labour.

No work was done by prison labour in the South Island. At Rotorua the average daily number of prisoners employed was 34·81; more could easily have been employed, but the Prison Department could not spare the men, as they were required for roadmaking and other works which that Department was undertaking. The total value of the work done by prison labour at Rotorua during the year was £3,119 6s. 8d. The total value of the work done by prisoners in the North Island since 1900 is now £44,485 18s. 8d.

State Assistance to Farmers in Tree-planting.

In order to give greater publicity to the fact that the State now supplies trees to farmers for planting for shelter, timber-supply, firewood, &c., County Councils were circularized and advertisements put in the *Journal of Agriculture* and weekly papers. The result was that there was a largely increased number of applicants, and the stock of available trees becoming exhausted before the end of the planting season, many applications had to be declined. There is a rapidly growing appreciation of the value of tree plantations on farms, and it is proposed to raise in the future a much larger stock of trees for this very important purpose. The total number of trees disposed of was 310,967.

Sale of Thinnings.

At the North Island plantations, where a considerable amount of thinning of the larch areas has been done, a large amount of timber was disposed of locally as firewood and to the mining companies as mine-props. In the South Island only a small area has been thinned, but the thinnings were either used on the plantations for fencing purposes or profitably sold as firewood.

Grazing Stock on Fire-breaks.

It is pleasing to state that the grazing of stock in the fire-breaks in the South Island plantations has been a complete success; the grass has been kept down, expense of ploughing saved, and a most satisfactory profit derived from the sale of wool and sheep.

Receipts and Expenditure.

In the past the expenditure on State afforestation has been provided out of the rents and royalties received from State forest reserves, supplemented during the last few years by an annual contribution from the Consolidated Fund.

As it was estimated last year that the receipts from State-forest reserves would amount only to a small sum (£10,404 being the actual amount received), and, seeing that the forestry operations have mainly a future commercial value, it was considered that the Consolidated Fund should not be called upon to provide the whole of the difference between the estimated expenditure (£32,643) and the estimated receipts. Provision was therefore made in the Finance Act (section 50) enabling the Minister of Finance to borrow £50,000 for forestry purposes, and during the year £10,000 was raised and placed to the credit of the State Forest Account. Before this provision was made the sum of £4,250 was obtained out of the Consolidated Fund to meet expenditure which had been incurred previous to the passing of the Finance Act. A sum of £2,478 was also received from sales of thinnings, &c., from plantations, sales of wool, &c.

Under the heading of expenditure a sum of £27,156 was paid in salaries, wages, supplies, &c., and £654 in management expenses of State forests.

A statement showing receipts and expenditure during the year is appended.

State Forests Account.

Receipts.	£ s. d.	£ s. d.	*Expenditure.*	£ s. d.	£ s. d.
Balance brought forward at commencement of year		3,208 15 0	Salaries, wages, and supplies, &c., charged to nurseries and plantations	27,044 9 4	
Rents, royalties, and fees from State forest reserves		10,404 12 9	Sundry expenses—Travelling-expenses, postages, &c.	111 6 7	
Proceeds from nurseries and plantations—					27,155 15 11
Thinnings	830 1 3		Management expenses of State forests		653 14 9
Trees and seeds sold to farmers	523 17 6		New Zealand Loans Act, 1908 (printing debentures)		0 7 0
Sales of sheep, wool, &c.	1,054 14 4		Balance at 31st March, 1917		2,530 9 0
Miscellaneous grazing-fees	68 5 10				
		2,476 18 11			
Transfer from Land and Survey vote		4,250 0 0			
Debentures issued under section 50, Finance Act, 1916		10,000 0 0			
		£30,340 6 8			£30,340 6 8

Shortage of Labour.

At both the North Island and South Island stations several officers and permanent hands enlisted in the Expeditionary Forces, and as it was impossible to get from outside sufficient experienced men to make up the losses, the whole permanent staff was hard pressed in carrying out the various works that have been done. The fact that the area planted was not less than that of the previous year was due to some extent to the fact that the planting-distance has in some cases been increased, with the result that the trees available stocked a larger area of land.

Employment of Discharged Soldiers.

Though endeavours were made to employ discharged soldiers on the plantations, it was found that comparatively few cared to take up this work. The total number employed during the year in both Islands was only twenty-four. At the present time only one is employed, all the others having left voluntarily. Those soldiers who were employed received the same pay as the ordinary hands.

In spite of the apparent unwillingness to take up forestry on the part of the men who have so far returned, it is expected that at the end of the war there will be large numbers of able-bodied discharged soldiers who will prefer this occupation to the less healthy employment that might be got in towns.

Land for Future Planting.

As the land reserved at Hanmer for planting was filled up, and as there was no available land nearby, Reserves 3421 and 4004, of a total area of 1,047 acres, were set apart for tree-planting. Later on a freehold area of 6,589 acres of poor stony terrace at Balmoral, adjoining these reserves, was purchased. There will now be in this locality a compact block of 7,636 acres available for future planting. The land, though too poor for profitable farming, grows pine-trees well, and as it is alongside of the railway it is very advantageously situated for the future disposal of the timber that will be grown.

As the land reserved for planting in the neighbourhood of Tapanui, in Otago, was nearly filled up, three small runs and a section of Crown land of a total area of 5,169 acres in Greenvale Survey District (all poor, hilly country) were set apart for tree-planting. The area not immediately required for planting will be let for grazing.

Experimental Planting.

The experimental planting that has been done at Galloway, in Central Otago, has not been successful, and it may be now concluded that commercial forests cannot be established on the poor lands that are available in this low-rainfall district.

Small plantations made at Tekapo and Omarama were not very successful, but this is probably due to the abnormally dry weather experienced, and further trials will therefore be made in these places.

SUMMARIES.

Summary of Operations in Nurseries during Year ended 31st March, 1917.

Name of Nursery.	Total Expenditure.				Trees in Nurseries.			
	Supervision and Clerical.	Permanent Works.	Tree-growing.	Total.	Estimated Trees raised during Year.	Output of Trees.		Estimated Number in Nurseries at 31st March, 1917.
						Trees sent to Plantations during Year.	Trees sent to outside Places during Year.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.				
Rotorua	655 18 6	391 3 6	3,519 10 7	4,566 12 7	738,700	4,062,216	172,115	5,202,030
Tapanui	315 10 0	21 19 5	1,377 11 2	1,715 0 7	2,767,000	670,055	100,818	6,324,800
Ranfurly	239 3 4	38 14 6	695 8 3	973 6 1	343,150	325,450	27,820	1,599,250
Hanmer Springs	168 10 0	20 0 0	1,293 13 4	1,482 3 4	2,000,080	361,848	13,714	4,365,800
Totals	1,379 1 10	471 17 5	6,886 3 4	8,737 2 7	5,848,930	5,419,569	314,467	17,491,880

Summary of Operations in Nurseries from 1896 to 1917.

Name of Nursery.	Total Expenditure.				Estimated Number of Trees raised.	Output of Trees.	
	Supervision and Clerical.	Permanent Works.	Tree-growing.	Total.		To Plantations.	To outside Places.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.			
Rotorua	4,640 15 2	10,655 13 1	49,937 8 7	65,233 16 10	58,799,454	52,251,965	1,345,459
Tapanui	3,689 0 0	5,098 3 11	24,195 17 1	32,983 1 0	23,835,539	13,998,253	956,138
Ranfurly	2,310 2 10	3,103 5 5	12,632 18 5	18,046 6 8	7,450,037	4,746,810	356,247
Hanmer Springs	1,752 11 10	3,082 9 6	11,930 18 11	16,766 0 3	16,968,942	9,368,073	521,654
Starborough*	423 13 3	2,756 17 3	6,075 16 7	9,256 7 1	3,059,610	1,965,095	1,094,515
Kurow*	205 0 0	2,004 18 5	860 4 2	3,070 2 7	172,460	..	172,460
Totals	13,021 3 1	26,701 7 7	105,633 3 9	145,355 14 5	110,286,042	82,330,196	4,446,473

* Nursery now closed.

Summary of Operations in Plantations during Year ended 31st March, 1917.

Name of Plantation.	Trees.			Expenditure.					New Area planted.	Cost per Acre planted.	General Upkeep per Acre planted.
	Number received from Nursery.	Number used to replace Losses.	Number planted on New Area.	Supervision and Clerical.	Formation, Buildings, Roads, Fencing.	Planting Operations.	General Upkeep.	Total.			
				£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Acres.	£ s. d.	£ s. d.
North Island—											
Whakarewarewa ..	623,707	112,647	511,060	775 5 9	522 16 9	978 2 10	2,385 18 3	4,662 3 7	349	5 19 2	0 6 0
Waiotapu	436,100	436,100	..	649 4 0	123 8 5	494 4 11*	1,096 15 5	2,363 12 9	..	..	0 3 1
Kaingaroa Plains ..	2,940,375	579,850	2,360,525	534 19 0	203 19 5	1,558 3 10	435 9 9	2,732 12 0	1,569	1 9 3	0 2 4
Puhipuhi	61,697	61,697	..	27 0 0	..	..	483 14 1	510 14 1	..	..	0 8 6
South Island—											
Conical Hills ..	81,400	9,300	72,100	196 13 4	0 9 0	116 15 5	523 13 6	837 11 3	60	2 6 8	0 3 9
Pukerau	551,305	..	551,305	223 6 8	491 10 0	957 15 5	461 19 1	2,134 11 2	383	2 15 2	1 6 7
Dusky Hill	3,000	3,000	..	200 0 0	..	..	34 3 10	234 3 10	..	..	0 5 6
Greenvale	..	..	..	52 2 10	410 7 4	2 5 0	3 5 2	468 0 4	..	..	..
Waitahuna	..	..	..	5 0 0	..	..	3 5 0	8 5 0	..	..	0 15 0
Gimmerburn ..	..	..	..	..	..	..	0 6 0	0 6 0	..	..	..
Naseby	322,950	6,850	316,100	197 10 0	129 16 0	427 0 7	249 11 1	1,003 17 8	174	3 1 8	0 4 7
Hanmer Springs ..	125,043	14,270	110,773	147 13 4	76 15 7	398 9 7	317 3 9	940 2 3	91½	5 3 6	0 2 5
Balmoral	222,605	..	222,605	243 16 8	501 9 0	1,184 6 8	113 10 1	2,043 2 5	108¾	4 12 4	1 2 6
Tekapo	48,000	..	48,000	12 0 0	5 10 0	133 18 11	21 9 4	172 18 3	29	4 18 7	0 15 2
Galloway†	3,050	3,050	..	..	..	..	3 10 0	8 10 0	..	..	..
Omarama†	..	..	..	..	4 16 9	..	..	4 16 9	..	..	..
Totals ..	5,419,232	1,226,764	4,192,468	3,269 11 7	2,470 18 3	6,251 3 2	6,133 14 4	18,125 7 4	2,764¼	..	..

* This expenditure incurred in preparations for planting in 1917. † Experimental.

Summary of Operations in Plantations from 1896–1917.

Name of Plantation.	Trees.				Expenditure.				Total Area planted.	Cost per Acre planted.	General Upkeep per Acre planted, per Annum.
	Number received from Nursery.	Number raised from Seed sown *in situ*.	Number used to replace Losses.	Total Number in Plantations.	Supervision and Clerical.	Formation, Buildings, Roads, Fencing.	Planting Operations.	General Upkeep.	Total.		
					£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Acres.	£ s. d.	£ s. d.
North Island—												
Whakarewarewa ..	20,254,521	109,725	3,651,790	16,712,456	6,716 18 10	7,446 11 4	29,414 8 10	18,703 13 9	62,281 12 9	7,954	4 19 2	0 2 6
Waiotapu	23,497,485	83,121	4,865,967	18,714,639	6,262 4 6	6,601 0 1	23,778 4 2	12,675 6 7	49,316 15 4	7,166	4 14 10	0 2 0
Kaingaroa Plains ..	7,780,125	..	854,775	6,925,350	2,406 1 3	4,253 6 0	6,209 5 11	1,376 12 3	14,245 5 5	3,839	2 11 0	0 1 3
Puhipuhi	2,954,049	..	1,954,049	1,000,000	1,104 9 7	1,201 16 2	3,840 11 11	5,921 4 5	12,068 2 1	1,200	5 2 0	0 7 7
South Island—												
Conical Hills	10,645,876	..	1,414,080	9,231,796	3,175 2 8	2,298 9 0	15,026 3 1	10,870 11 5	31,370 11 5	3,486½	4 14 9	..
Pukerau	663,165	..	..	663,165	388 6 8	634 14 0	1,166 10 9	583 15 1	2,773 6 5	446	3 0 11	..
Dusky Hill	3,026,397	..	845,560	2,180,837	2,466 4 2	1,239 6 4	7,426 17 4	3,463 15 4	14,596 3 2	845	10 5 8	..
Greenvale	..	..	..	..	52 2 10	410 7 4	2 5 0	3 5 2	468 0 4	..	..	..
Waitahuna	42,025	..	11,500	30,525	35 9 0	61 1 1	73 8 3	67 4 4	237 2 8	11	7 10 9	..
Gimmerburn	936,235	..	783,339	152,896	342 16 8	514 13 11	984 4 0	843 2 6	2,684 17 1	173	5 19 0	..
Naseby	3,679,400	..	421,001	3,258,399	1,573 13 2	1,584 4 7	4,926 14 4	2,858 14 7	10,943 6 8	1,282	4 9 2	..
Hanmer Springs ..	9,123,443	..	1,391,259	7,737,184	3,061 11 10	4,780 6 8	13,042 11 3	4,825 14 9	25,710 4 6	3,033¼	4 18 1	..
Balmoral	222,605	..	..	222,605	243 16 8	501 9 0	1,184 6 8	113 10 1	2,043 2 5	108¾	4 12 4	..
Tekapo	48,000	..	..	48,000	12 0 0	5 10 0	133 18 11	21 9 4	172 18 3	29	4 18 7	..
Dumgree	1,679,765	..	1,110,125	596,640	931 5 0	4,198 9 3	5,762 17 2	1,572 13 4	12,465 4 9	209	*	..
Galloway†	6,930	..	3,050	3,880	10 0 0	41 16 10	12 13 0	3 10 0	67 19 10	2	..	..
Omarama†	4,390	..	..	4,390	5 0 0	41 12 1	9 7 2	..	55 19 3	2	..	..
Raincliff	..	..	..	50,000	..	..	..	..	1,104 12 5	206	..	..
Totals	84,564,411	192,846	17,306,495	67,505,762	28,787 2 10	35,814 13 8	112,994 7 9	63,904 8 2	242,605 4 10	29,992	..	..

* Data not available. † Experimental.

REPORT ON AFFORESTATION OPERATIONS IN THE NORTH ISLAND.

(By the Superintending Nurseryman for North Island, Rotorua.)

I have the honour to forward herewith the annual report upon the afforestation work in the North Island.

Although the normal rate of progress has not been maintained, a perusal of this report will show that the results achieved are satisfactory. Owing to causes which are attributable to the war the operations have had to be largely curtailed and considerable difficulty has been experienced in adjusting matters to suit the altered circumstances. When it is realized that a period of three years is required to obtain seed and produce plants fit for sending to the plantations it should be readily understood that the curtailment had necessarily to be a gradual one. The quantity of seed sown during the past two years has been reduced to a bare necessity, but as there were about 10,000,000 young trees in the nursery at the commencement of the war it has been possible to arrange the planting in such a way that no sudden cessation of operations has occurred. It has been increasingly difficult to secure labour, and but for the fact that prison labour was available a serious loss of young trees must have resulted. Under the circumstances the protracting of the planting may be regarded as a good thing, insomuch that no sudden break in the work has occurred to disorganize the staff. Although the trees raised from seed during the year number only 738,000, the number of trees in the nursery at the 31st March was 5,202,000, or about half of the usual stock in normal times. The present stock includes trees which were in the nursery when the war started, these being held over in pursuance of a policy to plant only to prevent waste. During the year an additional area of 1,918 acres was planted, thus increasing the total area planted in the North Island to 20,159 acres.

Prison Labour.

The results obtained by the employment of prison labour continue to be satisfactory. During the year the value of work performed at the two camps by an average daily number of 34·81 prisoners employed was £3,119 6s. 8d., or an average value per man of £89 12s. 3d. Owing to the completion of the planting of the Whakarewarewa Plantation Reserve and the impossibility of securing further land within easy walking-distance of the prison camp at that plantation it was necessary to shift the prisoners on to a new site. At the end of December, 1916, all the prisoners and the necessary camp equipment were transferred to the Kaingaroa Prison Camp. The amalgamation of the camps was deemed expedient for financial reasons, and further because means were thereby afforded for allowing a number of officers to join the Expeditionary Forces.

The following table summarizes the work done by the prisoners :—

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.
		Years.	£ s. d.		£ s. d.
Waiotapu Plantation	1900–13	12·08	25,274 17 6	30·35	68 18 9
Whakarewarewa Plantation ..	1916–17	0·83	1,001 0 3	12·33	81 3 8
,, ..	1904–17	12·58	12,618 8 9	12·86	78 0 8
Kaingaroa Plains Plantation ..	1916–17	1·00	2,118 6 5	22·48	94 4 8
,, ..	1913–17	4·00	6,692 12 5	17·88	93 11 7

Sale of Trees to Farmers.

The applications received for trees were more numerous than was anticipated, and towards the end of the season a fairly large number had to be refused owing to the stock of trees having become exhausted.

There can be no doubt but that the decision of the Government to provide farmers with trees at a low price has greatly stimulated the interest in planting for the purpose of shelter and future timber-supply. It should be the aim of every farmer to grow his own fencing-timber and fuel, and if the encouragement given by the State will assist towards this end it will have served a most useful purpose.

The articles upon *Eucalypti*-growing from the pen of the Rev. J. H. Simmonds, which appeared in the *New Zealand Journal of Agriculture*, contain a valuable record of the author's experience with this useful class of trees, and it is evident from the numerous inquiries received by this Department that the articles mentioned have been widely read, and have greatly encouraged many who have hitherto had disappointing results with the planting of eucalypts. The inquiries for *Eucalypti* plants and seeds showed that the species described in the articles mentioned were chiefly in demand, and steps were therefore taken to produce the kinds likely to be asked for. During the coming year the price-list of trees available for farmers will include ten of the best species of *Eucalypti*, and also *Pinus radiata* and *Cupressus Lawsoniana*. Mossed plants of *Eucalypti* will also be offered, because a number of the species—principally the stringy-bark—are difficult to transplant, and for the further reason that the plants are better able, when mossed, to endure a lengthy journey.

The sale of trees has caused much extra clerical work. The acknowledgment of remittances, the adjustment of freight charges and correspondence incidental thereto, besides answers to correspondents seeking advice, have all contributed towards enormously increasing the office-work.

REVENUE.

The receipts for the year were as follows :—

	£	s.	d.
Sale of firewood (393½ cords)	559	0	9
Sale of mine-props (6,045)	144	7	0
Sales of rails, &c.	1	12	6
Sales of trees (172,115)	251	9	4
Sale of tree-seeds (27½ lb.)	22	3	9
Miscellaneous, grazing fees, &c.	68	5	10
	£1,046	19	2

ACCOMMODATION FOR LABOURERS ON PLANTATIONS.

The remoteness of the most of the plantation areas from any settlement has in the past been the chief factor in causing the adoption of a policy which provided for the employment chiefly of single men. Married men were not deliberately excluded from employment, but the want of cottages and educational facilities for children made the plantation work unattractive to them. In the earlier years while the planting was being done this could not very well be avoided, partly because prison labour was largely employed, but also on account of the work being every year in a different place, and gradually getting farther away from the starting-point. Amongst the many advantages which a country derives from its forests is the healthy and continuous employment provided for a by-no-means small proportion of its population, besides the finding of remunerative employment for its surplus rural labour during the winter months. In this connection it may be stated that European authorities estimate that 1,000 acres of forest will employ continuously from ten to sixteen men, representing a population of from fifty to eighty persons, not taking into account those engaged upon the carriage of timber and other manufacturing industries incidental to the timber trade. The scarcity of labour during the year, to which reference has already been made, was rendered more acute owing to the want of facilities for employing married men. It is, of course, admitted that conditions are abnormal, and that the available labour in the country should be used in the essential industries but the result of these conditions nevertheless indicates that a change of policy regarding the labour for the plantations is desirable. It is very necessary that an adequate supply of labour should be assured, more especially as the plantations have now reached the thinning stage and continuous employment can be found for about forty men. As soon as circumstances permit a number of workmen's cottages should be built. This would form the nucleus of what would eventually become a small township, with a school and other incidental necessities. It seems probable that among the many problems which will need to be solved after the war will be the finding of suitable employment for men who are partially disabled, or for whom an open-air occupation is essential. Forestry work is pre-emintly suitable for such men, who if need be could be permanently employed in one of the healthiest of occupations, thus enabling them to make a home for themselves and their families.

PROPOSALS FOR 1917–18.

Owing to the uncertainty of getting an adequate supply of labour the proposals for the ensuing year may have to be modified to some extent. Following is a broad outline of the work proposed :—

Rotorua Nursery.—Seeds sufficient to produce 2,500,000 trees have been ordered from France and America for sowing next spring. Should circumstances warrant any increase being made this number can be augmented by raising a crop of the quick-growing Monterey pine and *Eucalypti*.

It should be here noted that the crops to be raised next spring will not be ready for transferring to the plantation until the winter of the year 1919. Of the stock of trees at present in the nursery some 3,250,000 are fit for permanent planting during the coming season. The sale of trees to farmers is expected to account for about 250,000 of these, thus leaving about 3,000,000 which will require to be planted on the State plantations in the North Island.

Whakarewarewa Plantations—About 50,000 trees will be planted here, a small number of which are needed to complete a block of *Pinus radiata* which was not finished last year. The balance will be needed to replace deaths in last season's planting.

Waiotapu Plantation.—An area of about 1,000 acres is now under preparation for planting : 1,250,000 will be needed for this.

Kaingaroa Plains Plantation.—The preparations made are for planting 1,750,000 trees. A new area of about 1,200 acres will be planted, and the remainder of the trees used to replace blanks in last season's planting.

GENERAL.

Considerable changes in the staff have occurred during the year. Assistant Foresters R. MacRae, P. M. Page, and J. J. Rogerson volunteered for service in the Expeditionary Force. Two other vacancies were caused by resignations. These changes have necessarily thrown a great deal of extra work on the remaining officers, to whom the appreciation of the Department is due for the willing and zealous manner with which they have shouldered their added responsibilities.

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

H. A. GOUDIE,
Superintending Nurseryman, North Island.

ROTORUA NURSERY.

The weather conditions throughout the past year have been remarkably favourable for nursery-work, and the growth made by the young trees is better than it has been for many years past. In pursuance of the policy to reduce the operations as much as possible without incurring a loss of growing stock, the quantity of seed sown was extremely light, and resulted in some 738,000 trees being raised. As the annual production of trees in normal times has been about 5,000,000, it will be seen that very stringent measures have been adopted to release men for more important work. Most of the trees raised have made very good growth, and in the majority of cases the rate of germination has been quite satisfactory. The crop of Corsican pine was, however, a failure owing to the poor quality of the seeds.

The curtailment of planting operations has resulted in there being a much larger proportion of three-year-old trees in stock than usual. In order to prevent loss only the largest of the two-year-old trees have been sent to the plantations during the past two years, while the smaller-sized trees were lined out in nursery rows. These three-year-old trees have made very strong growth, and will be much more expensive to transport to the plantations.

Provision has been made for sale of trees to farmers to the extent of 250,000. These are chiefly *Pinus radiata* and *Eucalypti*, and all are well-grown sturdy plants.

The trial lots of Scots fir (*Pinus sylvestris*) are proving very disappointing. Notwithstanding the excellent weather experienced, these plants have made practically no growth, and there would appear to be no reason to doubt but that this species is quite unsuitable for this district. Small quantities of a number of eucalypts hitherto untried here are now under trial, and will be further reported on in due time. The several species and varieties of poplar which were imported direct from Kew in response to a request from this office have all succeeded with the exception of four sorts, which were lost owing to the cuttings being too weak to acclimatize. The plants have been planted where they can stool out in order to get a supply of cuttings. *Populus regenerata*, *P. Eugenei*, *P. robusta* have made very strong growth; *P. serotina* is good, but somewhat slower-growing than the preceding ones; *P. monilifera*, *P. angulata*, *P. nigra*, and *P. Petrowskyana* are still slower of growth. When the stools become thoroughly established it is proposed to propagate from them in order to give each of the kinds a thorough trial on the plantation reserves.

The crop of Douglas fir raised from seed in 1915 is of a type that has not hitherto been grown here. Some doubts which were felt about the plants in the seedling stage have confirmed the opinion that the plants are not out of the Pacific coast type. They are faster-growing than what has been known here as the Colorado variety, but have not the healthy vigour of the coastal variety. It is proposed to keep the plants for another year in the nursery in order to place the matter beyond doubt before sending the trees to the plantations.

The land not required for tree crops has all been placed under temporary pasture, from which a good crop of hay was secured, besides a very considerable amount of grazing. This method of restoring and improving the soil-fertility has proved most satisfactory, and, in addition, has supplied fodder for all the working-animals. Although a number of new weeds have been introduced to the nursery by medium of the grass-seeds sown, the system of green-manuring is gradually suppressing the troublesome sorrel-growth. This in itself is a great advantage, as sorrel has hitherto been the most troublesome of all the weeds that have to be contended with.

As will be seen by referring to the schedules of trees attached hereto, the number of trees in the nursery at the 31st March was 5,202,030, while the number transferred to the plantations and sold during the year amounted to 4,234,331.

The average daily number of workmen employed during the year was 28·79.

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.	
1916.	In.		Deg. F.	Deg. F.	
April	4·310	8	66	30	2
May	5·770	17	68	30	1
June	4·290	16	62	26	7
July	1·740	14	64	26	8
August	10·192	20	62	26	11
September	2·345	12	64	24	10
October	6·500	23	72	26	4
November	7·810	19	74	30	2
December	7·465	12	81	39	..
1917.					
January	2·440	13	84	45	..
February	5·610	13	85	41	..
March	2·310	8	80	40	..
Totals	60·782	175	..	..	45

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

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Amount of Seed sown.	Remarks.
			lb. oz.	
Cupressus Lawsoniana	25,000	5	2 0	Very good.
,, *macrocarpa*	2,000	2½	3 0	Very poor.
Eucalyptus botryoides	15,000	8	0 8	Very good.
,, *diversicolor*	1,500	12	0 3	,,
,, *eugenioides*	15,000	4	0 13	,,
,, *fastigata*	2,000	8	0 5	,,
,, *gigantea*	1,000	8	0 2	,,
,, *Macarthuri*	250,000	9	7 0	,,
,, *obliqua*	5,000	4	1 0	,,
,, *pilularis*	5,000	5	1 0	,,
,, *regans*	5,000	6	0 4	,,
,, *resinfera grandiflora* ..	50,000	7	1 10	,,
,, *saligna*	15,000	7	1 0	,,
,, *viminalis*	15,000	12	1 0	,,
Pinus Laricio	50,000	2	433 0	Very poor; old seed
,, *Banksiana*	30,000	2	14 0	Fair.
,, *radiata*	250,000	4	17 12	Good.
,, *canariensis*	200	8	0 2¼	,,
Sequoia sempervirens	2,000	7	2 0	Fair.
Total	738,700			

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

Name of Tree.	Number in Seed-beds.	Number in Nursery Rows.	Height, in Inches.	Remarks.
Cupressus Lawsoniana	..	12,000	12	Good.
Pinus Laricio	600,000	..	..	,,
,, *ponderosa*	..	225,000	6	,,
,, *radiata*	..	36,000	18	Very good.
Pseudo-tsuga Douglasii	1,500,000	..	2	Very slow.
Sequoia sempervirens	..	300	17	Very good.
Totals	2,100,000	273,300		
	2,373,300			

Details of Three-year-old Trees, sown 1914.

Name of Tree.	Number in Nursery Rows.	Height, in Inches.	Remarks.
Pinus Laricio	1,430,000	8	Very good.
,, ,, var. *taurica*	2,000	7	,,
,, ,, var. *cebennensis*	30	9	,,
,, *ponderosa*	12,000	7	Fair.
,, ,, var. *scopulorum* ..	550,000	..	,,
,, *Strobus*	33,000	4	Slow.
,, *sylvestris* (Finland)	12,000	2	Very slow.
,, ,, (Norway)	15,000	2	,,
Pseudo-tsuga Douglasii	36,000	11	Very good.
Total	2,090,030		

Details of Trees transferred to Plantations, &c., 1916–17.

Where sent.	Name of Tree.	Number.	
Whakarewarewa Plantation ..	*Carpinus betulinus*	43	
	Castanea sativa	200	
	Cryptomeria japonica	79	
	Pinus Laricio	47,175	
	,, *ponderosa*	26,450	
	,, *radiata*	136,560	
	,, *strobus*	85,125	
	Pseudo-tsuga Douglasii ..	326,850	
	Sequoia sempervirens	1,225	
			623,707
Waiotapu Plantation	*Larix europaea*	7,600	
	Pinus Laricio	425,500	
	,, *radiata*	3,000	
			436,100
Kaingaroa Plains Plantation ..	*Eucalyptus Macarthuri* ..	9,700	
	,, *viminalis*	650	
	Pinus Laricio	2,733,375	
	,, *ponderosa*	32,000	
	,, ,, var. *scopulorum*	103,650	
	Pseudo-tsuga Douglasii ..	61,000	
			2,940,375
Puhipuhi Plantation	Eucalypti species	61,697	
Run No. 24, Rangitikei	Assorted trees for experimental purposes	337	
Prisons Department, Point Halswell ..	Pines	25,000	
Sales to farmers	..	147,115	
			234,149
Total	..		4,234,331

Whakarewarewa Plantation.

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

(Assistant Forester, D. J. Buchanan.)

During the past year the planting of the remaining area suitable for afforestation was practically completed, and the area planted amounted to 411 acres, making a total area now under trees of 7,954 acres.

Trees to the number of 511,060 were used in planting new area, 111,100 to replace failures in the previous year's planting, and 1,547 in experimental underplanting. With the exception of a small area of approximately 40 acres, all the planting of new area was done by prison labour. The season being an unusually wet one has favoured the young trees, and there is consequently a very low percentage of failures. The species planted on new area were Douglas fir, Weymouth pine, Corsican pine, *P. ponderosa*, and Monterey pine; and all bear a healthy appearance, although the growth made is perhaps somewhat less than usual, owing no doubt to the lower average temperature experienced during the spring and summer months.

Vigorous growth has been made by Douglas fir and Monterey pine planted during the previous year, and on all the older blocks of pines, larch, and eucalypts the average height-growth made has been equally as good as, and in a number of cases greater than, in any previous year. On some of the *Eucalypti* blocks where patches of well-grown trees alternated with areas on which the growth was poor the improvement is most noticeable, and it is pleasing to note that on the latter areas the trees are now coming on well, and the blocks quickly assuming a much more uniform appearance. The absence of severe late frosts enabled the larch on the lower ground to make better growth than usual, and the trees on the older thinned-out area were greatly benefited by the moist weather which prevailed during the summer months. Amongst the Monterey pine a small number of deaths have been caused by the New Zealand root fungus, but the disease is at present confined to isolated individual trees, and does not appear likely to assume alarming proportions.

The daily average number of free men employed was 18·28, this being the lowest number employed for many years. Free labour was employed principally in general maintenance, and in work in connection with the utilization of larch thinnings. The shortage of labour continued throughout the year, and consequently it has only been possible to carry out absolutely necessary work, chiefly keeping down of growth on fire-breaks and amongst the young trees. Owing to the new fire-breaks on the area planted during the preceding two years being all unploughable and having to be kept in an efficient state by hand labour, the expenditure on this work has been doubled. Most of the older fire-breaks were kept in order as usual by ploughing and disking; a small area was sown down in permanent pasture, a system that is hoped will be

extended during the current year. The wet season has been responsible for an extraordinary heavy growth of bracken, and with the limited number of men available great difficulty has been experienced in keeping it down amongst the young trees. By free labour 72,600 pits were prepared at a cost of 9s. 6d. per thousand, and 52,560 trees were planted at a cost of 12s. 10d. per thousand. To enclose the new area planted by prison labour 166 chains of fencing was erected, in which a considerable quantity of material from the old boundary-fence was utilized, and about 250 *Eucalypti* posts out on the plantation were also used.

Prison Labour.—For the ten months during which prisoners were employed the daily average number of men was 12·33, and their earnings amounted to £1,001 0s. 3d., or an average per man of £81 3s. 8d. The work consisted of road-formation, clearing, pitting and planting new area, and general maintenance work. The men were transferred to Kaingaroa near the end of December, having then completed all available work within reach of the camp. All camp equipment and five huts were also shifted to Kaingaroa, and several huts, the property of the Prison Department, remain to be taken out when required. The main building, consisting of kitchen, storeroom, &c., will probably be converted into an officers' residence, and the remainder of the huts will be used for the accommodation of workmen.

It is gratifying to report that the sale of larch thinnings has been maintained steadily throughout the year, resulting in 393 cords of firewood, 6,045 poles, and 150 stakes, of a total value of £705 0s. 3d., being disposed of. Having an assured market, the work of classifying and stacking the timber was completed, and a sawing plant was purchased in order to supply the demand for firewood in lengths suitable for household purposes. With the present shortage of coal, and the high price of the usual lines of firewood, there is little doubt that the demand for larch will shortly increase, and as the stock in hand will probably be exhausted about the end of the winter it will be necessary, in order to maintain the present business, to resume thinning operations at an early date. It is also proposed to cut out a small area of *Eucalyptus coriacea* and work this entirely for firewood-production. A trial cutting of 1 acre on this area, which is fifteen years of age, yielded 260 fencing-posts, 240 mine-props, and 22 cords of firewood, or approximately 3,840 cubic feet of timber, which shows an approximate average annual increment of 256 cubic feet.

Rabbits and hares have done some damage amongst the trees planted during the past season, and were also responsible for about half the failures in the previous year's planting. Trapping and poisoning have been carried out as in former years, but as rabbits have been steadily increasing on the adjoining Native land during the past few years it is not possible to prevent a certain amount of destruction being done while the trees are small. Deer have also destroyed a small number of trees, chiefly on that part of the plantation adjoining the Okareka Game Reserve.

During the coming season the planting of the remaining small area of new ground will be completed. The total number of trees required will be about 60,000, inclusive of those to be used in replacing failures in the past season's planting.

Summary showing the Area of Whakarewarewa Plantation (7,954·34 Acres in Trees).

How occupied.	Acres.
Larch	2,557·80
Pines	3,125·49
Blackwood (*Acacia melanoxylon*)	79·00
Eucalypti	1,468·70
Walnut	9·70
Spruce, *Picea*, *Pseudo-tsuga*	643·31
Birch	5·80
Alder	8·94
Poplar	1·20
Chestnut	54·40
Roads, tracks, and fire-breaks	514·43
Land unsuitable for planting, including swamps, creeks, horse-paddocks, residence reserves, and water-main reserve	1,490·23
Unplanted land	164·80
Total	10,123·80

Waiotapu Plantation.

(Area, 7,777 acres; altitude, 1,200 ft. to 2,000 ft.)

(Assistant Forester, J. Mason.)

Afforestation operations have been carried out under almost perfect climatic conditions. The mild summer, assisted by frequent rains, produced a tree-growth which is probably unequalled in the history of the plantation; this is certainly the case in regard to the low-lying areas, where in former years late frosts continually cut back the more tender species. The only damage done was during September, when spring-like weather was followed by three weeks of heavy frost, and then the damage was confined to small areas of tussock country.

The whole of the enclosed area having been previously planted, all the trees received from the Rotorua Nursery, numbering 436,100, were used in replacing failures in former years' plantings. As there were no Corsican pine available during the previous season, the bulk of

the failures were with this species, these having been planted during seasons 1913 and 1914 on low-lying tussock land subject to unseasonable and heavy winter frosts.

Maintenance.—The expenditure in clearing around the young trees, although small in comparison with former years, was considerably more than was expected, as owing to the moist season there was an abnormal growth of bracken, particularly on the blocks of larch which had been thinned. In bracken-covered country this clearing is necessary for from three to five years after the planting takes place, according to the density of the bracken-growth and the rapidity of the species planted. The trees suitable for rapidly outgrowing and suppressing bracken are limited to a few species. The Corsican pine, which is somewhat slow for the first few years, needs protection from the bracken for four or five years after planting. With the Monterey pine a period of two years is generally sufficient to enable them to get well above the bracken. A lot of two-year-old seedling Monterey pine which were planted five years ago, at the rate of 2,700 to the acre, have completely covered the ground, and several specimens measured show an increase in height-growth of 7 ft., and one as much as 9 ft. 6 in. for the past season. The average height of the trees in this compartment is now 14 ft. *Pinus teocote* comes next to the Monterey pine in rapidity of growth, but has the disadvantage of being rather tender and having a poor root-system. The average height for this species is, under fair conditions, 16 ft. for six-year-old trees. *Pinus patula* is also a rapid grower, trees four years old having produced an abundance of branches which completely cover the ground and attained an average height of 10 ft.

Experimental Planting.—The Weymouth pine, growing as underplants on the thinned blocks of larch and silver-birch, are a splendid healthy lot. The results show that a fairly heavy thinning is necessary in order to get the underplants to succeed. The small lot of Japanese larch planted two seasons ago were slow to make a start, but have now become established, and show an average growth of 2 ft. for the past season.

Survey Work.—Compartment plans have been prepared for blocks 1 to 5 inclusive. These have entailed a good deal more labour than will be necessary on further work of this description, because the blocks dealt with were the first ones planted and contained many small compartments.

Proposals for 1917–18.—It is proposed to commence operations on a block of land on the Galatea Road, adjoining the present enclosure. The preparatory work of clearing and pitting was started during the summer, but the progress made has not been up to expectations owing to a shortage of labour. It is hoped that an area of about 1,400 acres would have been planted by the end of next winter, but the extent of the work will depend entirely upon the labour available. Two small cottages, which are inadequate for the requirements of the staff, are to be enlarged each to four rooms. The question of accommodation for workmen is one which must be faced in the near future. At present when vacancies occur returned soldiers and married men are given preference, but so long as the accommodation consists of a ten-by-twelve tent there will be no inducement for a married man with a family to take up this class of work. With the Great War still unfinished responsible officers are rightly expected to shoulder more responsibility, but when, as was the case at this plantation, all the skilled workmen were single men, who answered the call by enlisting, it simply meant that important works were either indifferently done or not commenced. With a few cottages, the rental from which could be made to pay the interest on the capital cost, married men could be employed, who it might reasonably be expected would endeavour to make their employment permanent. Many single men come to the backblocks with the sole idea of making a cheque and then returning back to the more populous centres, and generally leave about the time when they become of some value to the Department.

The average daily number of men employed during the year was 11·60.

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.	
1916.	In.		Deg. F.	Deg. F.	
April	3·34	10	76	23	12
May	4·71	18	68	18	12
June	3·53	18	66	16	13
July	2·51	17	61	18	15
August	7·26	23	66	19	15
September	2·09	10	70	15	17
October	5·92	22	70	23	9
November	7·32	19	75	25	3
December	6·88	12	83	30	1
1917.					
January	1·39	13	82	34	..
February	6·79	12	84	30	4
March	1·80	6	80	27	11
Totals	53·54	180	..	..	112

Summary showing the Area of Waiotapu Plantation (7,166·80 Acres in Trees).

How occupied.	Acres.
Larch	3,310·85
Pines	3,663·50
Eucalypti	180·50
Birch	11·95
Roads, tracks, and fire-breaks	312·30
Land unsuitable for planting, including swamps, creeks, horse-paddocks, and residence reserves	298·20
Total	7,777·30

Kaingaroa Plains Plantation.

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

(Assistant Forester, R. MacRae.)

A total of 2,940,375 trees were planted out during the year, of which 2,360,525 were planted on a new area of 1,569 acres, while the balance were used in replacing failures in the previous season's planting. The death-rate is fairly high on some of the blocks, but taken as a whole the average is not above normal. On the older portions of the plantation the trees continue to do well, the cost of establishing being the only direct charge against the 3,839 acres now in trees. The tree-planting done hitherto at this station has been confined to open tussock country upon which it was not necessary, except in patches, to expend labour in clearing off the growth prior to planting. The charges in this respect have therefore been very light in comparison with the other stations, and naturally have made a great difference in the cost of establishing. During the past year much of the land dealt with carried a fairly heavy stand of bracken and other dwarf growth, and the cost of clearing has been heavier than in the past. The expense in this respect is likely to be increased, as much of the reserve which will probably be planted in the near future is roughly undulating and heavily clad with bracken and tutu.

Temporary Nursery.—An experimental sowing was made at this station with four species of *Eucalypti*, the results of which are, on the whole, disappointing. The species tried were *E. obliqua*, *E. viminalis*, *E. Macarthuri*, and *E. regnans*. In each case the germination was good, but the subsequent growth made by the young trees was very poor. Apparently better shelter is required before this somewhat tender class of trees can be successfully raised here. The lined-out pines, numbering about 1,500,000, have made splendid growth. These will be lifted and transferred to permanent places in the plantation during the coming season.

Prison Labour.—With the closing of the Waipa Prison Camp all the prisoners were concentrated at the Kaingaroa Prison. The effect of this is shown by a slight increase in the average number employed compared with last year's figures. As practically all the land reserved for planting for some years to come will require to be cleared, and the maintenance work will be substantially increased owing to the rougher class of land being operated upon, it will be impossible to continue operations on the same scale as hitherto unless there is a considerable increase in the number of men employed.

The value of the work performed by prisoners was £2,118 6s. 5d. An average daily number of 22·48 was employed, the average earning per prisoner being £94 4s. 8d.

Free Labour.—An average daily number of 3·84 free men were employed. These comprise two officers, a horseman, and a rabbiter.

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.	
1916.	In.		Deg. F.	Deg. F.	
April	4·34	10	78	31	3
May	4·79	17	68	32	2
June	3·34	14	65	23	13
July	2·10	12	62	26	7
August	6·90	21	62	24	12
September	2·03	12	70	25	7
October	6·01	23	70	30	1
November	7·77	19	78	29	1
December	5·82	14	81	39	..
1917.					
January	2·14	12	82	39	..
February	8·53	9	82	41	..
March	1·91	5	80	41	..
Totals	55·68	168	..	..	46

Summary showing the Area of Kaingaroa Plains Plantation (3,839·616 Acres in Trees).

How occupied.	Acres.
Pines	3,473·864
Douglas fir...	340·176
Larch and chestnut mixture	25·576
Roads, tracks, and fire-breaks	446·180
Unplanted land	29,069·204
Total	33,355·000

Puhipuhi Plantation.

The rainfall for the year ending 31st March, which amounted to 101·70 in., is probably a record one for this district, and to this may be attributed the good growth which has been made by the trees. Some 61,000 trees were transferred from Rotorua Nursery and used chiefly for replacing deaths which had occurred in the areas planted during the two preceding years. An experimental planting of six species of *Eucalypti* was made, but the results were on the whole not very good. There are so many causes which may contribute towards failures that it is not safe to come to a hasty conclusion. One of the chief difficulties, of which mention has been made in previous reports, is the loss of trees in transit between Rotorua and Puhipuhi, a journey which occupies the best part of a week.

Some of the species of *Eucalpyti* are much faster-growing than others, and the large-sized trees do not endure a journey as well as the slower-growing hardy sorts. The loss in transit was very much less than during the two previous years, which is due to the plants being on the whole smaller than usual, and also to the fact that the heads of the trees were not covered except by sufficient battens to protect them from external injury. This method of packing entails considerably more expense in carriage, and would be prohibitive except for small consignments.

The growth made by the trees planted during the past two years is exceptionally good, and this is especially noticeable with *Eucalyptus resinifera grandiflora*. For the most part the planting was done on the faces of sheltered gullies, and the good growth made affords striking proof of the adverse part the wind has played towards the growth of *Eucalypti* generally throughout this plantation reserve.

The clearing and burning-off of 1,146 chains of boundary and cross fire-breaks cost at the rate of 2s. 6d. per chain. The boundary breaks average 1½ chains in width, while the cross-breaks are 2 chains in width. The cost is somewhat greater than usual on account of the rainy season, which caused a vigorous growth of bracken and greatly retarded the burning-off. The average daily number of men employed during the year was 3·35. Labour has been very scarce, and it has been impossible to attend to other than urgent work.

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.	
1916.	In.		Deg. F.	Deg. F.	
April	3.67	9	74	42	..
May	12·23	11	66	38	..
June	3·53	17	66	36	..
July	14·10	16	66	32	1
August	10·46	18	62	32	1
September	5·44	12	68	32	1
October	8·40	12	74	38	..
November	9·74	16	78	38	..
December	5·82	8	86	40	..
1917.					
January	8·96	14	76	48	..
February	14·82	8	78	40	..
March	4·53	14	78	40	..
Totals	101·70	157	..	..	3

Run No. 24, Rangitikei.

The work of controlling the sand-drift, as described in last year's report, has been continued, but owing to the necessity of curtailing expenses and also to the shortage of labour only one man has been employed during the year. As circumstances did not permit of an extension of the work, the available labour was used in maintaining that already done, and experimenting with different types of sand-catching fences and several kinds of trees. The most effective fence

used for accumulating the sand is one composed of manuka scrub bound closely together in an upright position to wires stretched between strong fencing-posts. Such a fence erected across a wind-channel on the line of the general summit of the dune causes the sand to accumulate in an astonishingly quick time, but the sand-drift has to be controlled to some considerable extent with open fences made of drift-wood erected about 9 ft. to 12 ft. distant on the windward side. These open fences are really the most vital part of the work, and considerable experience is needed to place them in the proper position. A badly placed fence will probably result in the scouring-out of a fresh wind-channel and do more harm than good. To make any progress at this class of work a gang of about a dozen men is needed, and the results most carefully watched by an officer on the spot, so that an error in the emplacement of a fence can be rectified before any serious damage is done.

There are a large number of cattle still on this run, and these have caused a considerable amount of damage to the sand-catching fences, and have also been responsible for fresh drifts having been started. It is impossible to effectually control the sand until all animals are excluded, because they eat off much of the grass that is binding the sand and break the surface of the ground, thus causing the loose sand to be scoured out by the wind. The experiments made with trees, although by no means conclusive, go to show that the *Pinus radiata* and *Cupressus macrocarpa* are likely to be the two best trees for extensive use here. Throughout this district many fine specimens of these may be seen in a thriving condition, and the plantation of pines growing in what was at one time loose sand adjacent to the Foxton Railway, demonstrates the fact that splendid results may be hoped for from *Pinus radiata*. A fire which damaged a portion of the plantation just mentioned has resulted in some very large trees being uprooted by the wind, and an examination of the roots shows that these have not penetrated the soil to any great depth. There is a great deal of moisture underlaying the sand at no great depth from the surface, which will probably account for the roots keeping so much to the surface. This fact should be noted as a guide to the treatment of plantations in these sand wastes. Two Japanese pines—*Pinus densiflora* and *P. Thunbergii*—have also made good progress in the experimental plot. Both of these pines are of considerable economic importance, but it is questionable if they would prove as profitable as *Pinus radiata*. The Sitka spruce, from which good results were expected, has not so far shown any great promise. This spruce is, however, generally very slow in starting, and it may yet prove valuable here. Douglas fir, Californian redwood, Weymouth pine, Corsican pine, and *Pinus ponderosa* are all being tried, but with each the results so far are not satisfactory. The conditions in this district are somewhat trying, as the strong winds soon dry up the sand, and the continual drift, even if it is actually not heavy, damages the young trees to some considerable extent and retards their growth. It is probable that a number of the trees that are being tried may yet succeed, as the difficulty appears to be in getting the young plants over the first few years.

The expenditure for the year amounted to £185 3s. 6d.

REPORT ON AFFORESTATION OPERATIONS IN THE SOUTH ISLAND.

(By the Superintending Nurseryman for South Island, Tapanui.)

Owing to the abnormal conditions now prevailing the impossibility of being able to present a very progressive report on afforestation generally is apparent. The year was characterized by extreme mildness. At each of the Otago stations the period between October and December inclusive was extremely dry, and at Ranfurly, where water was unprocurable, the young seedlings suffered in consequence. At Hanmer Springs, fortunately, rain was abundant and well distributed; and, in fact, the spring period proved to be an unusually wet one, hindering the progress of several important stages of nursery-work. Little or no damage eventuated from either frost or wind—two agents that rarely fail to interfere with the trees in either the seedling or later stage.

Labour Problems.

Operations have been conducted under extremely adverse labour conditions during the year under review. Gradually the eligible members of the branch are leaving the service to join the Expeditionary Forces, and, contrary to our anticipations, the discharged soldiers have not shown an inclination to accept work on the plantations, where the greatest demand for workmen exists. Some eighteen returned soldiers have from time to time been employed at either nurseries or plantations; but it is obvious that the preparation of pits for tree-planting in Otago, on the rough hillsides upon which afforestation is now being undertaken, unduly taxes men not in possession of their full strength, and rarely have the ex-soldiers remained in the service for any length of time. The usual considerations given to ordinary employees are meted out to the ex-soldiers, who doubtless would resent precedence being given them whilst in receipt of the

same remuneration. The healthy forestry-work certainly offers a somewhat wide field for the profitable employment of those returning from the war, although perhaps it would be unreasonable to expect a similar return of work from these men as from those who are hardened to the conditions. It might, then, be advantageous to form gangs solely of returned soldiers, and by introducing contract work each man would be able to work according to his inclinations or abilities, and receive proportional remuneration for same.

The South Island tree-planting work was necessarily curtailed to some extent simply because the required number of workers were not available. Every effort was made to secure suitable men without interfering with those engaged in farming pursuits. Then, again, in most country districts special inducements are offered by farmers to experienced workers, whilst the abnormal prices of rabbits lured others towards the trapping industry.

An idea originating from the acute state of affairs, and which is worthy of continuation, was carried out at Tapanui Nursery. On Saturdays during fine weather, when hand weeding and hoeing works were in a very backward state, about a dozen strong schoolboys were engaged at 5s. each daily, and the present satisfactory state of the nursery may well be attributed in some measure to the attentive manner in which the lads performed their duties. Present indications point to the necessity of having to revise the coming season's planting scheme, which will in all probability be based upon a reduced output of trees from the propagating nurseries.

Development of Grazing Proposition.

If any doubt has hitherto existed regarding the wisdom of introducing sheep on the plantations it should now be dispelled. A certain amount of risk attended the early stages of the venture, but we are now in possession of information that will enable the grazing proposition to be carried out on planted reserves with results greatly surpassing our most sanguine expectations. Knowledge has still to be acquired regarding the carrying-capacity of the various reserves, and instances have already occurred when the sheep, through slight overstockings, have temporarily disfigured such road-line plants as *Cotoneaster*, broadleaf, *Pittosporum*, and other native plants. Apart from these comparatively trivial defacings, no damage has resulted from the presence of the sheep, whilst horse-work has been reduced by about 30 per cent., and the firelines are in a more effective state than at any previous time. From a financial standpoint, too, the outcome is equally satisfactory, as the following table shows. Arrangements have been made to run about six hundred breeding-ewes this season on the Tapanui district plantations, and the conditions for a special grazing license will likely be drafted to meet the requirements at other stations in the meantime.

Statement of Stock Transactions.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Estimated value of stock on 31st March, 1916	444	8	0	Sales of sheep and lambs	902	14	0
Cost of sheep purchased during year ..	689	6	0	Sales of wool	152	0	4
Management expenses, dipping, shearing, &c.	15	16	10	Stock on hand at 31st March, 1917 (valuation)	689	6	0
Commission on sales	36	8	7				
Balance profit on year's transactions ..	558	0	11				
	£1,744	0	4		£1,744	0	4

Tree-raising Work.

In raising an estimated number of 5,110,230 seedlings in the three nurseries, as outlined in the schedules appended to detailed reports, good work has been accomplished. Of this total, however, Ranfurly Nursery has contributed only 343,150, and the sowing there must be regarded as a partial failure. It has been decided that during the next transplantation period this number will be supplemented by at least half a million from the Tapanui and Hanmer Springs Nurseries, so that the future output of trees in Central Otago will not be seriously curtailed. Unquestionably the raising of 2,698,000 seedlings of *Pinus Laricio* was the most interesting sowing undertaken, and the young plants are evidently of fine type and unusually robust. In accordance with the Department's intention to considerably increase the output of *Pinus radiata* a more extensive sowing of the species was conducted, and considerably over a million well-grown Monterey-pine seedlings will be available for transferring into lines during spring-time. Some 365,000 *Pinus ponderosa* eventuated from operating with 92 lb. of seed. The young trees, however, do not possess the attractive appearance of those raised three years ago, and to which type special reference was made in last report. In order to make provision for planting out several small areas eminently adapted for the development of *Cupressus macrocarpa*, efforts were directed upon raising a sufficient number of these trees for the purpose. An excellent crop of 113,600 plants was the outcome, and we shall thus be able to also supply the requirements of farmers, who evidently rely a good deal upon this tree for shelter purposes in the Otago and Southland Provinces. Interesting sowings of various eucalypts were attended with much success, and the thanks of the Department are due to Dr. Henry, Rev. J. H. Simmonds, and Messrs. T. W. Adams, and O. Bradley for their contributions of seeds for experimental purposes. The Superintending Nurseryman, Rotorua, also supplied a useful collection. After repeated trials in the best means of preparing seedling gums for permanent planting in the South, the "pricking off" into boxes method must be given precedence. The seed may be sown during October in beds, put out into boxes, each containing a hundred plants, in January, and about six weeks later conveyed and dealt with on the prepared plantation area. Absolute success has been achieved this season by adopting this method, which, however, is somewhat more costly than those tried unsuccessfully before. The young trees, some of each species shown on the accompanying schedule, have still to weather the winter, and the test will clearly demonstrate the possibilities of hillside planting with these hardwoods in South Otago.

Generally the lined-out trees have made excellent progress. The *Pinus radiata* have, in fact, made too vigorous headway, and extreme care will require to be exercised in their subsequent lifting and planting. Owing to the dryness it was deemed undesirable to effect the usual checking by wrenching, as the adoption of this measure would undoubtedly have accounted for the death of these somewhat frail growers at this stage. The nurseries are well stocked, and we are in a position to send out about 2,500,000 trees this season of the type aimed at. Notwithstanding the increased rates of wages and working-expenses, the amount incurred during the year in the raising of trees—viz., £4,170 10s.—is slightly below the outlay of the previous season.

Extension of Plantations and Brief Allusion to Tree-growth.

References have been made in a previous paragraph to the prime causes of our greatly reduced expansion-work. The original scheme outlined became impracticable for want of workmen, and it was only possible to operate with 1,357,353 trees, which have, however, by the introduction of the increased planting-distances, covered an area of 846¼ acres. The total area now planted in the South Island reaches 9,833½ acres, over which some 24,000,000 trees were originally planted. Two important reservations for immediate afforestation were made—one at Balmoral, Canterbury, where 1,047 acres of shingly, manuka-clad land were partly fenced and subsequently used for the overflow planting from Hanmer Springs, and the other at Greenvale, near Heriot, where an area of 5,169 acres has been set apart, 887 acres of which is now fenced, and preparations for the reception of 600,000 trees are being made. At each plantation the expenditure devoted to the construction of camps and rabbit-proof fences has greatly exceeded the outlay usually associated with such undertakings; but the abnormal prices prevailing account solely for these outstanding items of expenditure. It was necessary to provide accommodation for the foreman at Greenvale Plantation, and an inexpensive though serviceable four-roomed house is now in course of erection, which is being undertaken principally by our own labour. Ample provision for some years' planting in the Canterbury District has been made by the acquisition of approximately 6,589 acres of comparatively level scrub-clad land at Balmoral, adjoining the block now being operated upon. The railway-line from Christchurch to Culverden intersects this large tract of country, which, although providing sustenance for numerous rabbits, possesses little value from either a grain-producing or grazing point of view. There is no doubt in the possibility of being able to create a fine forest of commercially valuable timber on this waste land, although the preparation of ground for planting requires perhaps a slightly increased expenditure than is generally devoted to this phase.

Tree-growth is fairly uniform at each plantation, where the usual rate of progress is being maintained. At the older-established plantations the gradual replacement of the barkbound Piceas with fast-growing species of the *Pinus* genus is proceeding. A healthful appearance prevails throughout the various tree compartments, and an improvement in this respect is conspicuous with the larch, whose autumn foliage during the past two years is more typically golden.

Trees for Farmers.

The increased publicity given to the "trees-for-farmers" scheme caused a greater demand for trees than was looked for. Consequently it was only possible to supply the requirements of some 165 applicants, who were supplied with 138,852 trees, valued at £250 4s. 5d., from the following nurseries: Tapanui, 100,818; Ranfurly, 24,320; Hanmer Springs, 13,714. It is gratifying to be able to state that quite a number of planters have since notified me of their general success with the trees supplied, although in several cases the planting of the eucalypts was attended by partial failure. At an increased price, however, a limited number of gums will be available this season in boxes, and should reasonable care be exercised by the planter at least a 90-per-cent. growing percentage of these trees should eventuate. Again, the applications for *Pinus radiata* (Monterey pine) far exceeded those for all other varieties, and in supplying 63,130 we were scarcely able to fill half of the requirements. The position is different this year, however, and fully 200,000 Monterey pines have been specially reserved for the purpose Amongst other varieties supplied were—*Pinus ponderosa*, 19,750; *P. Laricio*, 13,772; *P. muricata*, 12,900; *P. pinaster*, 1,175; poplars, 8,715; *Cupressus macrocarpa*, 3,070; eucalypts, 7,720. Both *C. macrocarpa* and poplars were over-requisitioned for, and this fact will influence the propagation of those trees in future. As might be expected, it has been necessary to revise the price-list, and the slightly increased charges for all varieties of trees will also cover the cost of supplying only specially selected first-grade stock.

Experimental Plantations.

Pronounced success has not been the outcome of certain phases of experimental work conducted in various parts of Otago Central, nor does this fact create surprise to persons conversant with the intensely unfavourable weather conditions prevailing this season, when meteorological statistics disclose the fact that only two or three very light showers fell from November to March, the period over which moisture is so essential for plant-development. For instance, such trees as Douglas fir, birch, &c., in the Tarras district, although well established and having attained the height of about 10 ft., succumbed to the intense aridity of the surface, whilst newly planted trees carefully attended to in cultivated ground also failed to survive the trying conditions.

At Sugarloaf Hill, near Lowburn Ferry, the preliminary work in connection with a scheme for alleviating the dust nuisance was embarked upon. Included in the proposition was the forming of a rabbit-proof enclosure and planting therein 4,195 trees of the following varieties: *Pinus ponderosa*, *P. Laricio*, *P. radiata*, *P. muricata*, *P. pinaster*, *P. austriaca*, *Populus fastigiata*, *P. deltoides*, *Cupressus macrocarpa*, and *Eucalyptus Macarthuri*. In addition the sand-deposits were judiciously covered with marram-grass, and depots of the same sand-binding agency running at right angles to the prevailing wind were created across the plateau, some 12,000 sets

being thus used in the operations. Much interest was shown in the experiment by local residents and school-children, who gave able assistance. Of the varieties planted *Pinus ponderosa* and *P. radiata* have been mostly successful. Anticipations were also borne out by the marram-grass growing freely, although in the more unprotected positions rabbits have evidently eaten the succulent shoots with avidity. With the development of the root-system, however, the grass sets should speedily get beyond the influence of the pest and form the desired pioneer wind-break for future tree-planting. Arrangements have been made to replant the failures in the enclosure with the varieties of tree that show greatest adaptability to the conditions, and the result will likely influence subsequent reclamation-work in the locality.

Galloway Plantation.—Exceptionally robust specimens of *Pinus ponderosa*, *P. Laricio*, and *P. radiata* were raised at Ranfurly and Tapanui Nurseries for the second trial in this small reserve; and, although ideal conditions during the planting period were experienced, the subsequent drought accounted for wholesale losses, and proof beyond a doubt has now been secured that it is impossible to create forest plantations generally on the dry hills in this district without the application of water. On the cool lee-side of the hill probably 30 per cent. of *Pinus radiata* are succeeding, so that it is reasonable to assume that a fair measure of success would be attained in afforesting the more humid and moisture-retaining valleys surrounding. It is not desirable at the present moment to dismantle the fence, as already the native grasses in the enclosure unmolested by the rabbits are making great progress, and another year's protection will undoubtedly, without artificial aid, convert the barren surface of eighteen months ago into useful pasture.

Tekapo Plantation.—In pursuance of the policy outlined in last year's report planting operations were commenced on the enclosed area near Lake Tekapo, Mackenzie country, where some 48,000 trees, consisting principally of the hardier pines (as outlined on the appended schedules), were used. A fair growing percentage have eventuated, but here also the dryness was not conducive to even normal issues. It was hoped to greatly expand the work in this locality immediately; but we are at present faced with the serious problem of how to secure the services of suitable men for the undertaking, and it is likely that extension-work will be deferred here until the following season, when a more settled condition of the labour-market is expected.

Omarama Plantation.—The creation of a forest in this district will be by no means an easy proposition, judging by the present appearance of the trial plantation established about eighteen months ago. Due allowance must be made, however, for the abnormally dry season. In this case also the Monterey and western yellow pines have stood the test better than other varieties dealt with. An interesting feature of the trial is the marked superiority of growth trees have shown that occupy positions amongst the tussocks over those planted on the surface destitute of vegetation. Once again poplars by their complete failure have shown that their propagation in exposed situations without attention is not an easy matter, and *Pinus Laricio* does not possess the abnormally hardy drought-resisting characteristics usually attributed to the species. About 2,000 trees will be planted out here during the coming early spring, and the outcome of this work, together with that of the previous season, should furnish interesting matter for a later report.

Sources of Revenue.

To simplify the acknowledgment of moneys received, occasioned by the expansion of business and initiation of the "tree-for-farmers" scheme, my appointment of Receiver was approved, and during the current year £1,429 19s. 9d. was officially received and placed to the credit of the Public Account. The amount was derived from the following sources: Sale of sheep, £902 14s.; trees, £250 4s. 5d.; timber, £125 1s.; wool, £152 0s. 4d. Thinning activities at each station have been temporarily suspended, although the sales of timber referred to above consisted entirely of firewood supplied to local residents at Hanmer Springs, where evidently a ready sale is effected for this commodity. At Dusky Hill Plantation a large proportion of the fencing-material required for the temporary fences at the newly started Greenvale Plantation was cut from the larch compartments, and not being impregnated with any antiseptic solution it will be interesting to note the durability of these posts.

General.

At the present moment it is not possible, with any degree of accuracy, to outline the coming year's proposals. On the nurseries fully 2,500,000 trees are available for distribution to associated plantations, and this number would afforest approximately 1,600 acres. An attempt will be made to grow 150 acres of oats and wheat on the unused portions of the departmental property. This scheme will be carried into effect for a small expenditure, and the outcome, besides providing fodder for the requirements of our own stock, should materially assist in swelling the season's grain-output.

Several official changes occurred during the year. Nurseryman-in-charge A. W. Roberts resigned from Ranfurly, and was succeeded by Nursery Foreman W. T. Morrison, in whose position Nurseryman A. S. Jenkins now acts. Plantation Foreman A. J. Boydell was transferred from Hanmer Springs to Balmoral to act in the same capacity there, whilst Assistant Forester Dunnet was appointed in charge of Greenvale Plantation. Plantation Foreman Screen, of Naseby, left with the Expeditionary Forces, and in his place Assistant Forester J. Graham is acting. With the above-mentioned semi-organization of the staff it will be evident that the general direction of work has been increasingly difficult; but I have to express my thanks for able and willing assistance rendered by members of the staff generally.

To the previous list of employees who have joined the Expeditionary Forces may be added J. Armstrong, J. Blythe, D. Hanrahan, A. Jacobs, C. Jones, J. T. Kenny, J. Lawlor, C. Lunam (killed), J. Morrison, T. O. Screen, J. Tregerthen, M. Young (wounded).

R. G. Robinson,
Superintending Nurseryman for the South Island.

Tapanui Nursery, Otago.

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

(A. S. Jenkins, Acting-Foreman.)

The conditions for raising seedlings here this season have been all that could be desired. The rainfall, 31·74 in. on 144 days, was quite sufficient for requirements, whilst the extremely mild autumn and winter favoured the late development of all young trees. The absence of continued high winds so prevalent in September was also marked, and altogether the general success attending propagation-work equals that of our most favourable seasons.

Raising of Seedlings.—Seed-sowing was conducted under normal conditions, and some 2,767,000 sturdy plants have resulted from operating with a slightly increased weight of seed. Perhaps the excellent crops of 1,500,000 *Pinus Laricio* and 700,000 *Pinus radiata* are the outstanding features of the sowing, but almost without exception all varieties sown came up to expectations, and it is safe to assert that the quality of the seed used has rarely been better. Experimental work with the eucalypts was continued, and we now possess information that should simplify the hardening-off of the gums sufficiently to permit of a reasonable measure of success resulting from their planting in this somewhat severe climate. The demand from farmers for the favourite shelter-tree—*Cupressus macrocarpa*—should be more than met next year, when the 65,000 seedlings will reach a desired size for permanent planting. A fine bed of Douglas fir of the desired type, containing about 60,000 plants, resulted from a sowing of 20 lb. of seed. Detailed on the associated schedule are the estimated numbers of seedlings raised.

Transplanted Trees.—The unusually large number of 1,701,600 one- and two-year-old trees were transplanted into lines from beds. A good growing percentage eventuated, and probably slightly over a million trees will be sufficiently advanced for permanent planting during the coming winter. Much success attended the lining-out of *Pinus radiata*, although the late summer development of these trees has been too vigorous, and the dry weather forbade the safe adoption of wrenching as a retarding measure. Partial failure, however, is noticeable amongst the *Pinus muricata* and *Cupressus macrocarpa* breaks, and this can only be attributed to the drying winds experienced shortly after they were transplanted. The demand from settlers for poplars influenced the extended propagation of the two varieties *Populus fastigiata* and *P. deltoides*, and some 17,500 cuttings were prepared, resulting in an excellent growing percentage.

Horse-feed.—About 30 acres were used in producing sufficient fodder for the horses engaged at local stations. Owing to the amount of hand labour required to grow carrots it was decided to substitute swede turnips, which winter feed is equally relished by the live-stock, and certainly the condition of the animals is unchanged. Some 8 acres was put down in rye and clover, whilst an area similarly dealt with two years ago was turned into a grazing-paddock. As some of the nursery paddocks are showing signs of running out, it will be necessary to resow them during the coming spring. A small stack of sheaf was threshed and realized 80 sacks of oats, the operation also providing an abundant supply of straw for packing purposes.

General.—The unsatisfactory state of our water-supply made it necessary to construct a small reservoir in such a position as to provide a greater pressure. The service is now all that could be desired, as apart from the better pressure the water is purer. For some months difficulty has been experienced in securing suitable labour for the nursery-work, and the idea of employing schoolboys on Saturdays for certain phases of the work has been entirely successful. The usual maintenance-work was carried on, and the buildings, stores, fences, &c., are in good order.

Expenditure for the year amounted to £1,715 0s. 7d.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1916.	In.		Deg. F.	Deg. F.	
April	1·54	13	75	29	4
May	2·98	12	69	24	13
June	2·32	9	64	22	10
July	1·90	9	56	18	20
August	3·05	11	63	25	20
September	2·62	14	71	27	6
October	2·30	14	74	26	8
November	3·18	17	79	31	1
December	0·64	5	86	34	..
1917.					
January	2·42	10	93	34	..
February	5·53	18	85	34	..
March	3·26	12	81	29	2
Totals	31·74	144	..	..	84

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

Name of Tree.	Number in Seed-beds.	Amount of Seed sown.	Remarks.
		lb.	
Pinus Laricio	1,500,000	150	Well-grown plants.
,, *ponderosa*	100,000	35	Strong plants.
,, *radiata*	700,000	108	Excellent crop.
,, *pinaster*	20,000	4	Strong plants.
,, *muricata*	150,000	16	Excellent crop.
,, *canariensis*	400	½	Strong plants.
Larix leptolepis	25,000	20	Fair results.
Pseudo-tsuga taxifolia	60,000	20	Good type.
Picea excelsa	65,000	4	Germinated well.
Cupressus macrocarpa	65,000	8	Excellent crop.
Betula alba	5,000	½	Strong plants.
		oz.	
Eucalyptus Macarthuri	35,000	8	Germinated well.
,, *viminalis*	30,000	32	,,
,, *obliqua*	3,500	16	,,
,, *globulus*	2,500	16	,,
,, *regnans*	3,500	3½	,,
,, *gigantea*	1,500	3½	,,
,, *amygdalina*	500	1	,,
,, *piperita*	100	6	,,
Total	2,767,000		

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

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Remarks.
Pinus Laricio	2,000,000	..	Excellent progress has been made by all seedlings and lined-out trees.
,, *radiata*	..	560,000	
,, *muricata*	..	10,250	
,, *pinaster*	..	7,000	
,, *Banksiana*	20,000	..	
,, *Taeda*	450	..	
,, *Thunbergii*	..	200	
Cupressus macrocarpa	..	3,250	
Sequoia gigantea	..	500	
Eucalyptus Macarthuri	..	1,500	
,, *viminalis*	..	1,200	
Populus deltoides (cuttings)	..	14,500	
,, *fastigiata*	..	3,000	
Total	2,020,450	601,400	
	2,621,850		

Details of Three-year-old Trees, sown 1914–15.

Name of Tree.	Number in Nursery-lines.	Remarks.
Pinus Laricio	775,000	90 per cent. of these trees are sufficiently strong for permanent planting this season.
,, *ponderosa*	145,000	
Pseudo-tsuga taxifolia	5,500	
Picea sitchensis	550	
Fraxinus excelsior	7,750	
Various trees	2,150	
Total	935,950	

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

Where sent.	Name of Tree.	Number.	
Conical Hills Plantation	*Pinus Laricio*	9,300	
	,, *radiata*	72,100	
			81,400
Pukerau Plantation	,, *Laricio*	98,750	
	,, *ponderosa*	160,530	
	,, *Benthamiana*	5,925	
	,, *austriaca*	98,725	
	,, *radiata*	159,575	
	,, *muricata*	600	
	,, *pinaster*	8,050	
	,, *Taeda*	1,550	
	,, *Thunbergii*	1,275	
	Larix leptolepis	800	
	Pseudo-tsuga taxifolia	8,625	
	Eucalyptus viminalis	1,475	
	,, *Macarthuri*	450	
	Populus deltoides	4,975	
			551,305
Dusky Hill Plantation	*Pinus radiata*	..	3,000
Tekapo Plantation	,, *Laricio*	11,050	
	,, *ponderosa*	7,250	
	,, *radiata*	3,000	
	,, *pinaster*	200	
	,, *Taeda*	200	
	,, *scopulorum*	10,000	
	Larix leptolepis	150	
	Pseudo-tsuga taxifolia	100	
	Eucalyptus viminalis	100	
	,, *Macarthuri*	200	
	Populus deltoides	1,475	
	Various trees	80	
			33,800
Galloway Plantation	*Pinus Laricio*	500	
	Eucalypts (var.)	50	
			550
Mackenzie County Council	Assorted forest-trees	..	10,000
Public Works Department, Lake Coleridge ..	,, ...	..	18,100
Green Island Domain Board	,, ...	..	200
Lawrence Borough Council	,, ...	..	500
Otanomomo School	,, ...	..	200
Queenstown Borough Council	,, ...	..	800
Vincent County Council	,, ...	..	1,470
Waihemo Domain Board	,, ...	..	3,900
Waikakahi Domain Board	,, ...	..	100
Westland Hospital Board	,, ...	..	500
Farmers	,, ...	..	65,048
Total	..	..	770,873

Conical Hills Plantation, Otago.

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

(W. J. Dunnet, Plantation Foreman.)

The meteorological records taken at this plantation almost coincide with those registered at other district stations. The heaviest monthly rainfall (5·64 in.) occurred during February, when several heavy downpours greatly benefited the growing trees after a prolonged spell of dry weather. On sixteen occasions in July the temperature receded to below freezing-point, although, as the appended schedule will show, a comparatively mild winter was experienced. Of the 81,400 trees received from Tapanui Nursery some 72,100 were used in planting on new area, whilst the balance were specially reserved for replanting previous failures. There are now 3,486½ acres under forest-trees at this station, and the planting of an additional 50,000 trees

during the coming winter will complete the area available. Several small compartments throughout, however, will require to be attended to, and the replanting of hardwoods and Piceas where desirable will be undertaken gradually.

Excellent headway in tree-growth has been made throughout. In every situation *Pinus Laricio*, *P. ponderosa*, and *P. radiata* are succeeding, and fortunately no ill effects of wind-pressure are noticeable amongst these trees, notwithstanding the exposed positions they occupy. Anticipations have not been realized here regarding the trial planting of *Eucalyptus Macarthuri* and *E. viminalis*. The young trees have rooted, but evidently the cold, sour nature of the surface does not meet their requirements, and success in gum-planting in this district can only be attained by planting on warm hillsides. The usual maintenance-work occupied the attention of five men, whose services will require to be retained. An excellent return from our sheep-grazing proposition again resulted; and, moreover, in no previous year were the fire-lines kept in such an efficient state.

A sum of £837 11s. 3d. was expended in the various works during the year, thus increasing the total expenditure at this station to £31,370 11s. 5d.

Rainfall, Temperature, &c

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1916.	In.		Deg. F.	Deg. F.	
April	1·15	9	68	30	4
May	2·69	9	60	28	11
June	3·67	12	54	30	13
July	1·45	8	54	24	16
August	3·22	10	63	28	14
September	2·97	12	62	28	7
October	0·86	10	70	28	5
November	4·05	14	78	30	2
December	0·53	3	82	38	..
1917.					
January	3·06	10	82	38	..
February	5·64	18	80	34	..
March	3·01	11	81	29	2
Totals	32·30	126	..	..	74

PUKERAU PLANTATION, OTAGO.

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

(H. Howe, Plantation Foreman.)

Much delay was experienced in securing fencing-material for completing this enclosure, with the result that the extermination of rabbits, which were unusually plentiful on the area, was a difficult proposition. Every known means of combating the pest was introduced, and, although subsequently the reserve became practically clear, it was not before some of the earlier-planted trees received injury, from which, however, they are gradually recovering. The season's growing percentage is excellent, and particularly noticeable in this respect are the 159,575 *Pinus radiata*. Probably a 3-per-cent. death-rate will cover losses. The *Pinus ponderosa* have also succeeded beyond expectations. Perhaps in no previous year have the poplars made such promising headway, and their progress next season should influence the decision of further utilization of the *Populus* for fire-break margins. So far the *Eucalyptus viminalis* and *E. Macarthuri* are promising well, and on becoming acclimatized there is no reason why these hardy types should not succeed in the favourable position allocated. Much horse-labour was necessary in opening up the internal and boundary fire-barriers. In several places, however, the presence of rocky outcrops forbade cultivation with the teams, and the chipping of tussocks, &c., will require to be done by the more costly method of hand-labour. A small gang will be retained at this station to complete the planting of the enclosed area, which will hold about an additional 150,000 trees, consisting of *Pinus radiata* and eucalypts. Several of the camps were dismantled and conveyed to the new site at Greenvale, whilst the remaining tents will be gradually transported as circumstances warrant.

The expenditure for the year amounted to £2,134 11s. 2d., and the total since initiation £2,773 6s. 6d.

Dusky Hill Plantation, Otago.

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

(F. Benfell, Plantation Foreman.)

The weather conditions prevailing here during the past year were very favourable for tree-growth generally. A total rainfall of 32 in. was distributed over 134 days, and the absence of severe frosts was conspicuous.

Steady uniform progress may be noticed in all pine, larch, and oak blocks; but, contrary to expectations, the shelter and humidity provided by the fast growers is having little effect upon the Piceas occupying elevated positions, and the work of replacing these unsuitable trees with other varieties that are succeeding under similar conditions will be continued. The older portion of this plantation comprised various deciduous and evergreen trees in mixture. An early suppression of ash and Piceas permitted the larch and few Douglas firs to grow freely, and after seventeen years' growth the remaining trees have almost sufficient growing-space to permit of the desired girth-development. It is interesting to record the fact that a large number of larch fencing-posts, required for enclosing the reserve at Greenvale, were cut from this block, and with the coming dearth of timber in this district there is no doubt that the disposal of larch saplings for fencing and firewood purposes will be a payable proposition.

The expenditure during the year amounted to £234 3s. 10d. Such works as replanting, tree-pruning, removal of coarse growth from around young trees, cutting tracks, keeping fire-breaks in an efficient state, and general caretaking-work were undertaken by the one man employed, whilst assistance was procured occasionally in the various phases of sheep-management. The grazing proposition was again quite successful, and the flock is gradually attaining bigger dimensions. The lambing percentage exceeded 100, whilst the net return from our wool-sales realized £40 9s. 5d. All fire-lines have been much improved by the presence of the sheep, which do no harm to the trees. This plantation, which borders the Pomahaka River, is becoming very popular as a picnic resort, and during public holidays it is necessary for at least one man to patrol the river reserve in order to suppress any outbreak of fire that might arise from the carelessness of visitors.

Greenvale Plantation, Otago.

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

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

Towards the latter part of the year it was decided to undertake the afforesting of Run 212G, which is situated about five miles in a westerly direction from Heriot. Generally the area consists of rough fern and tussock-clad hills intersected with steep gullies, and possessing surface soil and substratum of a strong argillaceous nature. Over a large proportion of the block the early preparation of pits will be necessary so that frost-action on the upturned soil will effect the desired pulverization. The contour of the country renders the laying-off and formation of fire-breaks difficult, and assistance was secured in this direction from a departmental surveyor. It is only reasonable to anticipate that the working-costs here will exceed that recorded at other stations, although particularly vigorous tree-growth may be expected throughout the eastern slopes and gullies. The work of enclosing about 770 acres is now proceeding. Efforts to have this labour performed by contract were unavailing, and finally the whole working-gang was employed constructing the three miles and a half of boundary-fencing, which is now nearing completion.

Camp-formation.—To provide accommodation for about twenty men two large unused huts, each 20 ft. by 12 ft., were drawn by engine from Conical Hills and two smaller buildings from Pukerau. In addition four new huts, 10 ft. by 12 ft., were constructed at a cost of about £30 each. A quantity of old iron in stock was utilized in constructing a serviceable shed for various purposes, and the whole camp is now compact and comfortable. For the resident foreman, Mr. W. J. Dunnet, a neat four-roomed cottage, containing the usual conveniences, is also nearing completion. This building has been erected chiefly by nursery labour, and when finished should cost about £200.

Every effort will be made to plant out here during the approaching season 700,000 trees. Expenditure to date, £468 0s. 4d.

Ranfurly Nursery, Central Otago.

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

(W. T. Morrison, Nurseryman in Charge.)

Climatic conditions experienced during the past season have been anything but conducive to successful nursery-work, a very dry period having occurred just at a time when moisture was most needed. Although the actual precipitation was slightly above that of last year, the months of December and January were exceptionally dry. The total rainfall for the year was 16·21 in.

Lining-out operations were commenced on the 8th September, and completed on the 27th October under rather trying conditions both as regards labour and soil. The amount of labour was inadequate, and the soil was in a rather dry state; in fact, only two or three light showers were experienced during the whole operation. The area used for the purpose has been recently brought into use, and the ground was necessarily not in such a fine state of cultivation as is

desirable, the trees consequently not making the progress one might expect from ground which has not previously been impoverished by successive cropping. It was very variable in places, and trees which were planted on the same day and under exactly the same conditions have shown a marked difference in progress. This is most noticeable with *Pinus radiata*, which have done excellently in one part and only indifferently in another. *Pinus ponderosa* have made good uniform progress, but *P. Laricio* suffered rather severely during the dry spell mentioned above, and a fairly large death-rate has resulted. Larch, which was lined in, has made very little growth, but as this species is not being included in future planting operations the loss is immaterial, except that it reduces the anticipated output considerably.

Seed-sowing was commenced on the 28th October under fairly good conditions, but the result, owing to the dry spell, has not been in any way successful. *Pinus Laricio*, contrary to the usual experience, has germinated very poorly indeed, whilst various other species, such as *Pseudo-tsuga taxifolia*, *Thuja gigantea*, *Cedrus deodara*, and *Cupressus formosensis*, are quite a failure. The most regrettable failures are those of *Pinus radiata* and *P. muricata*. The former was sown in the open without any protecting covering, in a similar manner to last year; but, unlike last year's experience, has failed utterly. This is mainly attributable to want of an efficient water-supply, and proposals have been put forward for the purchase of an engine and pumping plant for the coming season—a most essential detail if success in future seasons is to be expected. The severity of the climate in this district is such as to warrant every precaution to avert failure through want of facilities for watering during a season like the one just experienced.

A sowing of 10 lb. of *Pinus radiata* seed was made late in the season, which has given an additional 30,000 seedlings; but it is not anticipated that these will be sufficiently far advanced for transplantation, while there is also the danger that they will suffer from frost-lifting during the winter months.

An experiment which should prove interesting is being tried with *Eucalyptus Macarthuri*, but it is too early yet to say whether they will stand the severe frosts of this district. Of the two-year-old seedlings, *Pinus Laricio* and *P. Ponderosa* have made the best progress, and these should give good results when lined out next spring, provided climatic conditions prove normal.

The probable output of trees to plantations, &c., for the coming season is estimated at present to be between 400,000 and 500,000; but this is a fairly conservative estimate, and it may be possible to increase this number slightly if subsequent growth comes up to expectations, the number above stated having allowed for the elimination of trees which appeared too small at the time of counting. Reference to this will be found in the Naseby Plantation report. The output of trees to plantations and farmers, &c., amounts respectively to 325,450 and 27,820, thus bringing the total output for the season to 353,270.

In spite of the scarcity of labour and reduced staff the various works necessary to keep the nursery in working-order have been carried out satisfactorily, but more surface cultivation would have been an advantage during such a dry season. Small crops of lucerne hay and oats were cut and harvested, which will prove of value as horse-feed during winter.

Green manure was ploughed in in several nursery-breaks, which it is intended to utilize for lining-out purposes next season, and this should prove beneficial in providing nitrogen and fibre for the next crops, especially in those breaks in which lucerne has been turned under.

All buildings are in fairly good order, but require painting, and this will now have to be postponed till next summer.

The total expenditure for the year was £973 6s. 1d., and the total since initiation amounts to £18,046 6s. 8d.

The average number of men employed was 4·4.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1916.	In.		Deg. F	Deg. F.	
April	1·43	7	76	27	7
May	1·76	9	66	20	21
June	2·30	9	63	22	14
July	1·66	10	58	18	25
August	1·06	8	61	24	22
September	1·34	6	71	27	16
October	0·74	9	69	27	7
November	2·08	16	76	31	3
December	0·68	5	85	36	..
1917.					
January	0·73	8	86	34	..
February	1·12	7	85	32	1
March	1·31	7	81	28	1
Totals	16·21	101	..	..	117

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

Name of Tree.	Number in Seed-beds.	Seed sown.	Remarks.
		lb.	
Pinus Laricio	198,900	100	Very poor crop.
,, *ponderosa*	75,600	27	Even crop.
,, *pinaster*	3,800	1	Sturdy trees.
,, *radiata*	32,400	10	Late sowing
Picea excelsa	16,300	1	Good crop.
Cupressus macrocarpa	8,600	2	Sturdy plants.
		oz.	
Eucalyptus Macarthuri	4,500	2	Good crop.
,, *piperita*	50	1	Sparse.
Poplar cuttings	3,000	..	Fair strike.
Total	343,150		

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

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Remarks.
Pinus Laricio	500,000	..	Good strong plants.
,, *ponderosa*	200,000	..	,,
,, *Benthamiana*	200	..	,,
,, *radiata*	..	69,400	,,
,, *muricata*	3,000	..	Poor.
Larix leptolepis	10,000	..	,,
Pseudo-tsuga taxifolia	19,000	..	Very small.
Cupressus macrocarpa	..	2,000	Fair only.
Totals	732,200	71,400	
	803,600		

Details of Three-year-old Trees, sown 1914–15.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Remarks.
Pinus Laricio	126,200	166,300	Only fair.
,, *ponderosa*	..	160,000	Very good.
Totals	126,200	326,300	
	452,500		

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

Where sent.	Name of Tree.	Number.	
Naseby Plantation	*Pinus ponderosa*	102,750	
	,, *radiata*	65,800	
	,, *Benthamiana*	12,000	
	,, *austriaca*	119,150	
	Larix leptolepis	7,500	
	,, *europaea*	5,000	
	Populus fastigiata	4,700	
	,, *deltoides*	5,400	
	Alnus glutinosa	650	
			322,950
Galloway Plantation	*Pinus ponderosa*	1,000	
	,, *austriaca*	1,000	
	,, *radiata*	500	
			2,500
Tapanui Nursery	*Populus fastigiata*	..	3,500
Mackenzie County Council	*Larix europaea*	..	1,000
Vincent County Council	Assorted forest-trees	..	2,725
Farmers	,, ...	..	20,595
Total	..	..	353,270

Naseby Plantation, Central Otago.

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

(J. Graham, Acting Plantation Foreman.)

The rainfall for the past season shows little improvement on that of the preceding one, which was the driest on record. Although the dry weather suits the growth of many of those trees which have become established for a number of years, the smaller recently planted ones show signs of growth having been retarded, while this season's planting shows a fairly heavy death-rate. The dry period experienced during the months of December and January badly affected many of the younger transplants, which up till that time were making very good progress and giving every promise of a successful "strike." As an indication of the exceptional dryness of the season it may be mentioned that creeks and springs that were never known to fail since the commencement of operations here have this year dried up completely.

Pinus radiata seems to have suffered rather more severely than other pines, but this is natural with this soft-needled species, which seems unable to endure the excessive transpiration which they were evidently called upon to withstand. *Pinus ponderosa*, *P. Laricio*, and *P. austriaca*, being of a hardier nature, have not suffered to the same extent, but still there is a fairly large death-rate among these also. Taking the plantation right through, the advancement made by the various trees has been very good, and their vertical growth in the established blocks is well above the average. Prominent amongst the older trees is that of *Pinus Laricio*, while *P. ponderosa*, a tree which usually shows the best results, comes next. This refers chiefly to the variety known as the large-seeded *ponderosa*, which stands out distinctly as the one we should endeavour to obtain in the future. A comparison between the two varieties shows an advantage of 100 per cent. or more in the growth of the large-seeded, and where they are planted together one would say there was a difference of three to four years in their respective ages. Another feature worthy of notice is that of the abnormal growth, comparatively speaking, of several species which were given an additional year in nursery-lines before being transferred to plantation. These have been planted in strips between trees of a year younger; but the progress made strikes one as being out of all proportion to the difference in age, while at the same time hardly one replant was necessary. The question is, with such a practical demonstration of the advantage of planting an older tree, would it not pay to retain certain species for an additional year in nursery-lines? This refers mainly to the two species *Pinus ponderosa* and *P. Laricio*. *Pinus radiata* is, of course, too fast-growing to apply this system to, but the idea seems worthy of consideration if a further experiment proved consistent with the above observation.

Larch has made rather inconsistent progress, the older-established trees showing signs of what appears to be the disease known as "needle-cast"; but the younger trees in the recently planted area look healthy, and have made as much as 2 ft. to 3 ft. of growth. They are, however, patchy. The planting of poplars for the purpose of forming fringes to fire-breaks has resulted in failure, fully 90 per cent. having died. Although they do well in the district generally, there is evidently something in the soil of this plantation which is unsuitable to their growth. They will be tried in cultivated ground this coming season as a final test, but they have failed under all conditions so far, whether planted in wet or dry soils.

The number of trees planted for the season was 322,950, of which 316,100 have been planted on new area covering about 130 acres, and 6,850 were used for replanting blanks.

Contract pitting has been carried on, and some 430,000 pits are now available for the coming season's planting.

All fire-breaks have been kept in order, and the ever-increasing work of breaking up new ones has been gone on with and practically completed for the season. It will be necessary to remove the division-fence between the newly planted area and the pitted area and re-erect this on the south-western boundary, which work will be undertaken during the coming winter.

The total expenditure for the year was £1,003 17s. 8d., and the total to date £10,943 6s. 8d.

Employment was given to an average of 4·7 men.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1916.	In.		Deg. F.	Deg. F.	
April	2·05	8	72	27	14
May	2·00	11	62	19	23
June	2·62	9	64	20	18
July	1·96	11	54	16	29
August	1·59	10	60	19	29
September	1·83	6	68	22	6
October	1·91	8	68	22	19
November	2·67	14	77	28	9
December	0·63	7	84	30	1
1917.					
January	0·58	8	89	28	2
February	2·27	9	86	28	4
March	1·68	6	81	26	3
Totals	21·79	107	..	..	157

Gimmerburn Plantation Reserve.

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

(W. T. Morrison, Nurseryman in Charge.)

There is nothing of note to record in connection with this plantation. Since initiation the locality has not evidenced any special adaptability for the successful growth of trees, and operations here have been attended with a considerable amount of difficulty and with only indifferent results. It has, however, served to demonstrate in a way the species which might with careful handling meet with a fair measure of success. *Pinus austriaca* is the dominant species at present, but there is evidence that *P. ponderosa* will probably prove the best species to utilize in completing the planting. The area occupied by trees at present covers about 100 acres, and the bulk of the remainder has been leased for sheep-grazing purposes, the lease terminating on the 30th April. This is not, however, a paying proposition for the Department, and it is intended to prepare during the next season for the completion of tree-planting. In the meantime preparation is being made to crop a considerable area with oats and wheat, from which, judging by previous experience in this direction, a successful return might be expected, the expressed desire on the part of the Minister of Agriculture for every effort towards increasing the area sown in cereals this year being the main inducement to undertake this proposition, apart from the benefit to ourselves in providing horse-feed, &c. As soon as the crop is removed pitting for tree-planting could be commenced, provided sufficient labour is available, or failing this the Department might very well use the ground for sheep-grazing, the success of which has been amply demonstrated at the Tapanui stations. The blanks in the present planted area require filling up, and two men could be engaged at this work while at the same time giving necessary attention to sheep.

During the year the usual work of cutting noxious weeds and the eradication of rabbits, which have been fairly numerous, has been carried out.

Hanmer Springs Nursery, Canterbury.

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

(W. G. Morrison, Nurseryman in Charge.)

Rain fell on 109 days during the year, the total precipitation being 42·87 in.—almost double that of the preceding twelve months. Compared with the previous year there was a substantial increase in the rainfall, but the precipitation was not well distributed throughout the year, as will be seen by perusal of the meteorological sheet, the main rainfall taking place from the month of July to November. During the principal growing months there was a dearth of moisture and a prevalence of high temperature much above the average, and as a consequence the standard of tree-growth was not up to that of previous years. Crops grown for horse-feed also suffered from lack of moisture, and it is anticipated that a shortage of chaff will be experienced during the winter.

Tree-growing.—Owing to the adverse weather conditions prevailing during the main growing months the growth of all nursery stock was much below the average. The results obtained from seed-sowing were fairly satisfactory, however, a total of 2,000,080 seedlings being raised. The work of lining out seedlings proved fairly successful, a total of 985,100 plants being transferred to the nursery-lines under medium conditions. The subsequent growth, however, was not good, but the plants appear to be sturdy enough. Owing to lack of labour it was found necessary to leave a very large number of seedlings in the seed-beds for a further season. The trees intended for transfer to plantations, &c., have only made fair headway, with the exception of Austrian pine, but have a hardy appearance, and it is anticipated that from 800,000 to 1,000,000 will be available for transfer. The number sent out to plantations, &c., during the year was 375,562, as per schedule attached. The total number of trees in stock on the 31st March was 4,365,800.

Horse-feed.—Between 50 and 60 acres was put down in crop during the spring, the result being much below the average and producing but 30 tons of oatsheaf. Two crops of clover hay were cut from the old seed-bed area, the result being a stack of about 8 tons of good winter feed.

General.—All areas not under trees were put down in oats, the stubble being ploughed in after harvesting the crop. The whole area treated under lime the previous year is now showing the beneficial effects of this treatment, the sorrel having decreased to a very appreciable extent. The usual attention was given to the upkeep and general cleanliness of premises. Repair works were effected in connection with the wagon, drays, implements, and tools. The stable buildings received a much-needed coat of paint, and a commencement was made with the repainting of dwelling, office, &c.

Proposals.—The purchase of two useful horses for wagon purposes is recommended, and also the purchase of a more suitable wagon for the distribution of trees and general carting purposes.

The daily average of men employed throughout the year was 6·7.

The expenditure for the year amounted to £1,482 3s. 4d., the total expenditure to date being £16,766 0s. 3d.

Rainfall, Temperature, &c.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1916.	In.		Deg. F.	Deg. F.	
April	1·73	7	78	24	7
May	7·48	13	67	20	15
June	1·21	10	66	19	23
July	5·19	12	65	16	23
August	6·18	11	67	20	27
September	4·77	8	73	19	21
October	3·36	11	70	24	8
November	6·19	14	74	30	3
December	0·29	2	89	35	..
1917.					
January	2·66	2	90	32	1
February	1·96	11	83	30	3
March	1·85	8	84	29	2
Totals	42·87	109	..	..	133

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

Name of Tree.	Number in Seed-beds.	Amount of Seed sown.	Remarks.
		lb.	
Pinus Laricio	1,000,000	114	Good plants.
,, *ponderosa*	190,000	30	,,
,, *pinaster*	14,000	2	,,
,, *muricata*	100,000	11	,,
,, *radiata*	400,000	90	,,
Larix leptolepis	120,000	30	Poor crop.
Pseudo-tsuga taxifolia	100,000	14	Good plants.
Picea excelsa	30,000	2	Fair crop.
Cupressus macrocarpa	40,000	4	Good plants.
		oz.	
Eucalyptus Macarthuri	6,000	2	Good plants.
,, *piperita*	80	1	Poor crop.
Total	2,000,080		

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

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Remarks.
Pinus Laricio	700,000	260,000	Small plants.
,, *ponderosa*	240,000	..	Good plants.
,, *Benthamiana*	..	220	,,
,, *radiata*	..	300,000	Medium plants.
,, *muricata*	..	80,000	Poor plants.
,, *Taeda*	..	700	Fair plants.
,, *pinaster*	..	2,000	Good plants.
Larix leptolepis	200,000	..	Medium plants.
Pseudo-tsuga taxifolia	70,000	..	Good plants.
Cupressus macrocarpa	..	1,800	Medium plants.
Poplar cuttings	..	20,000	Fair plants.
Totals	1,210,000	664,720	
	1,874,720		

Details of Three-year-old Trees, sown 1914–15.

Name of Tree.	Number in Nursery-lines.	Remarks.
Pinus austriaca	300,000	Fine trees.
,, *ponderosa*	158,000	Sturdy trees.
,, *Benthamiana*	3,000	,,
,, *pinaster*	4,000	,,
,, *muricata*	8,000	Fine trees.
Pseudo-tsuga taxifolia	18,000	,,
Total	491,000	

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

Where sent.	Name of Tree.	Number.	
Hanmer Springs Plantation ..	*Pinus radiata*	106,423	
	,, *Laricio*	5,250	
	,, *ponderosa*	2,350	
	,, *muricata*	6,520	
	,, *Taeda*	1,900	
	Thuja gigantea	1,400	
	Sequoia gigantea	1,200	
			125,043
Balmoral Plantation	*Pinus austriaca*	171,000	
	,, *ponderosa*	41,130	
	,, *muricata*	2,600	
	,, *scopulorum*	6,875	
	,, *Benthamiana*	1,000	
			222,605
Tekapo Plantation	,, *austriaca*	13,000	
	,, *muricata*	1,200	
			14,200
Justice Department, Paparua	Assorted forest-trees	..	2,264
Farmers	,, ...	..	11,450
Total	..	..	375,562

HANMER SPRINGS PLANTATION, CANTERBURY.

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

(W. G. Morrison, Nurseryman in Charge.)

Owing to the transfer of operations to the newly acquired area at Hurunui and the completion of tree-planting on all but a small area at this station there is little to report on for the past year. The pitting of the small area adjoining Jollie's Pass was completed during April, the fencing being then taken in hand and the tree-planting completed immediately the fence was erected. The trees have since done fairly well, though the dry weather experienced during the summer months somewhat retarded growth. The area burned out during the previous year was planted up with seedling *Pinus radiata*, but owing to the dry weather these proved a failure, and it is proposed to replant with two-year-old trees during the coming season. Trees to the number of 110,773 were planted on an area of 91½ acres, making a total of 3,032¾ acres now under forest, containing 7,737,184 trees. A total of 9,020 trees were used to replace failures in former plantings. The usual uniform growth has taken place among all varieties of established trees, and the various blocks are now looking remarkably well in spite of the continued dry weather. Though one or two late frosts were experienced, no damage was done to any of the more tender varieties of trees.

Throughout the greater part of the year the staff was engaged almost exclusively on work in connection with the general upkeep and maintenance of plantations, the more important duties receiving attention being as follows: Grubbing out noxious weeds; clearing foreign growth from around young trees; repairing fences, tools, &c.; destroying hares and rabbits; ploughing and chipping fire-breaks.

The growing of horse-feed also received attention, but the crop was below the average owing to the dryness of the season. Firewood to the amount of 116 cords was disposed of during the year at £1 per cord.

The grazing of sheep on fire-breaks proved a most profitable proposition, and the scheme is worthy of further extension.

The daily average of men employed throughout the year was 5·3, and the total expenditure was £940 2s. 3d.

Balmoral Plantation, Canterbury.

(Area, 1,047 acres; altitude, 550 ft.; commenced operations, 1916.)

(A. J. Boydell, Plantation Foreman.)

Operations on this new plantation, which is situated about seven miles from Culverden, were commenced on the 15th May last. The land on this area is of an intensely stony nature, and was also covered with a dense growth of manuka-scrub, and before pitting or planting could be done a sufficient area to accommodate the trees in hand had to be cleared. A camp for the employees had also to be formed, and for that purpose four huts were transferred from Hanmer Springs, which were supplemented by four tents, thus providing accommodation for fourteen men. 500 acres of land was cleared of scrub and burned off. Pits to the number of 454,425 were opened, and 222,605 trees were planted, comprising the following varieties: *Pinus ponderosa*, *P. Benthamiana*, *P. scopulorum*, *P. muricata*, and *P. austriaca*. A remarkably good strike took place among all varieties, which demonstrates that this waste land is eminently adapted for afforestation purposes. Pits to the number of 231,820 are now available for the reception of trees from the nursery, and it is estimated that 800,000 trees will be dealt with during the approaching season.

A length of 102 chains of fencing was erected, and 40 chains of old fence was converted into rabbit-proof fence. Material is now on the ground for the purpose of enclosing a further area for the approaching season's planting. An area of about 20 acres was enclosed for a horse-paddock, and a combined stable and vehicle shed was erected.

A good water-supply was obtained adjacent to the camp by sinking to a depth of 20 ft.

Rabbits were numerous on the area, but by poisoning and trapping the pest is well reduced.

The daily average of men employed throughout the year was 10·4, and the expenditure for the year amounted to £2,043 2s. 5d.

PART II.—NATIVE FORESTS.

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

Output from Mills.

As far as was ascertained by the inquiries of the Commissioner of Crown Lands, the total output of timber for the Dominion was 352,500,000 superficial feet, but a considerable amount that was cut on private lands is not included in this. Of the above amount quoted the Auckland District produced 182,000,000 ft., Wellington 63,720,000 ft., Hokitika 50,211,000 ft., and Southland 24,500,000 ft. There was practically no native timber milled in Canterbury, and in none of the other six land districts did the amount milled exceed 8,000,000 ft. The output of kauri was about 52,000,000 ft. Slackness in the building trade, scarcity of labour, difficulty of export, and other war conditions have tended to restrict the output.

Export of Native Timbers.

From the table supplied by the Comptroller of Customs it is found that during the year the export of native timbers was 77,515,856 superficial feet, of a total value of £419,935. In 1913 (the year before the war) the export was 63,547,459 superficial feet, of a value of £319,279. This shows that in spite of the shortness of shipping and other adverse factors resulting from the war the export of timber has largely increased.

Import of Timbers.

The amount of timber imported during the year (not including laths, rails, posts, and shingles) was 19,112,290 superficial feet, including 3,684,740 superficial feet of Oregon pine. The total value of all timber imported was £190,903. There were also imported 3,057 tons of tanning-bark, valued at £31,563. In 1913 there were imported 46,907,877 superficial feet of sawn and hewn timber, which, together with imported round logs, laths, rails, posts, and shingles, was valued at £504,882.

Revenue received from Royalties and Sales of Native Timbers.

The revenue received during the year as royalties and rents from State forests was £10,404 12s. 9d., of which £9,204 was received through the local offices and the balance through other sources. This was paid into the State Forests Account. The revenue received from licenses and sales of timber on national-endowment lands was £10,226. The revenue received from timber licenses and sales of timber on Crown lands was £12,817. The total of above amounts was £32,247.

Royalties on Timber increased.

Though for a considerable number of years the price of timber had been steadily rising, the royalties received for timber cut on State lands had remained unaltered. The result was that the royalties had become quite disproportionate to the values of the converted timber. It was therefore decided to raise the royalties, and a new scale was gazetted in February. Even with the increases the new royalties bear a smaller proportion to the value of the converted timber than is the case in most countries where the forests are under organized management.

Increase in Prices of Timber.

The prices given below are prices in Wellington, and are higher than the prices of the same timbers in other towns, but they serve for purposes of comparison. The enhanced values that our chief timbers have reached will tend to restrict their use for many purposes, and for such purposes our inferior timbers will in the future be used. Another result of the rise is likely after the war to be the importation of soft woods from other countries.

Price per 100 Superficial Feet.

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

* Clean sap white-pine suitable for butter-boxes and cooperage is 19s. per 100 superficial feet.

Duration of Supplies.

Without a survey it is impossible to give the area of land carrying commercial forest nor, except in the case of kauri, can more than a guess be made of the amount of the various milling-timbers that our forests contain. Kauri is our most valuable milling-timber, but if the present annual rate (52,000,000 ft.) of cutting is continued our supply will not last more than seven years.

As stated above, the largest output of timber is from the Auckland Land District, but it is estimated that at the past rate of conversion the present stand of all timbers in that district will not last twenty years. In the Taranaki and Hawke's Bay districts there are only a few small areas of milling forest left, whilst in the Wellington Land District the milling forest, which is confined to the Waimarino, will last little more than a decade.

In the South Island there is no milling forest left in the Canterbury Land District; in Nelson and Marlborough the area is very small; in the Otago District the milling forest produces scarcely enough timber for the present local consumption. In Southland there is still a fair area of milling forest, but the Commissioner of Crown Lands estimates that the red-pine will be exhausted in about twenty-eight years, and the white-pine in about sixteen years. This estimate does not, however, allow for the largely increased demands on Southland forests that will be the result of the exhaustion of the supplies in other districts. Black-pine and totara are not plentiful, but occur sporadically in the forest. Beach is plentiful, but, being what is technically termed a hard wood, it cannot fully take the place of soft woods. The largest forest of commercial timber is now in Westland, but the Commissioner for that district estimates that the milling-timbers (rimu and white-pine) will at the *present* rate of cutting last only about twenty years.

The great expansion that has occurred in recent years in the dairy and fruit industries, together with the great demand that there has been in Australia for our white-pine, has caused heavy cuttings to be made of this timber. The forests of pure white-pine that used to exist on the extensive swamp lands of the Auckland District have almost gone, and the time is close at hand when the white-pine scattered in our mixed timber forests will be insufficient to supply the demand.

Puriri and silver-pine, both so valuable for railway-sleepers, have almost gone, and their place is now being taken by imported Australian hardwoods or ferro-concrete. Except in the case of hardwoods, the exhaustion of the supply of one kind of timber usually results in an increased use of other supplies of an inferior timber, or in the importation of a foreign timber technically as useful but generally more expensive.

From the foregoing it will be seen that our supplies of milling-timbers are less than has generally been estimated, that they are being rapidly used up, and that great care and economy must be exercised in the management of our remaining forests.

Timbers formerly rejected now used.

In the past failure to recognize their values has been responsible for some timbers of the very highest qualities being wasted. As an instance of this kohekohe and pukatea may be quoted. The former is related to and closely resembles Spanish mahogany, and if now obtainable would be worth as much as that valuable timber. Pukatea formerly existed in considerable quantity in swampy areas in many parts of the North Island, but now only odd trees are found in mixed forests; its timber closely resembles the valuable "yellow poplar" of the southern United States.

Of timbers formerly rejected or only slightly used for milling purposes, but now coming into use, may be mentioned taraire, tawa, and the native beeches (generally called "birches"). Taraire is only a small tree, but north of Auckland it is to be found in considerable quantity. When dressed it bears considerable resemblance to oak, and for many purposes may well take the place of that timber. With the enhanced price of white-pine and its increasing scarcity there is already a growing demand for tawa timber for various purposes in which durability is of no great moment. It may be stated that it is being used most satisfactorily for the strong packing-cases in which kauri-gum is being exported. The silver-beech, though not durable in the ground, is very suitable for furniture, and is now being largely used for this purpose. There is a growing market for this timber in Australia, and it is gratifying to find from the return supplied by the Government Statistician that there were 5,710,000 ft. of beech timbers put through the mills for the year ending 31st March, 1916. The amount milled this year is not obtainable, but beech timber has this year been noticed in different kinds of packing-cases, for which purposes they had not been used previously.

Improved Methods of measuring Timber in the Forest.

Owing to the presence of the valuable kauri in the forests of the Auckland District, an accurate method of measuring the standing milling-timbers has for some years been practised there; in some of the other districts, however, the method of measuring was so crude that the results obtained were merely approximations. Though the lesser values of the forests in those districts may scarcely as yet warrant the adoption of the Auckland method of measuring the timber, a modification of this method will in the future be adopted. Also, where possible, in places where the royalty-on-the-output system prevails, it is proposed to abandon that system, as experience has proved that such a system results in timber being wasted both in the bush and in the mill and a loss of royalty to the State. It may be stated that the Auckland system of measuring the standing timber costs only 1d. per 100 superficial feet in that district.

Increase in the Use and Consumption of Timber.

In spite of the use of many substitutes, statistics show that the world's *per capita* consumption of wood is fast increasing. Though the war has caused a set-back in private building, it has made large demands on European forests, for huge amounts of timber had to be found by the various belligerent nations for the construction of military works. Previous to the war the use of timber for pulping purposes was increasing rapidly. Some of the materials now made from wood-pulp are artificial silk and other clothing fabrics, floor-rugs, twine, and pots for holding such soft material as honey, cream, &c. So many articles are now being made from wood-pulp that a European paper has declared that "to be without wood is almost as bad as being without bread." The consumption of gasolene and other derivatives of petroleum is increasing with great rapidity. Sir Boverton Redwood, the highest authority in the world on petroleum, has said that at the present rate of consumption the world's available supplies of this material will be exhausted in twenty-five years' time. It seems, therefore, that the prices of gasolene, petrol, &c., are never again likely to be as low as they were before the war. The result will be that some cheaper material will be sought for, and the one most likely to be used is wood-alcohol, which has been termed by Professor V. Lewes "the one illimitable fuel." The Forest Products Laboratory of the United States has recently discovered a method of producing wood-alcohol at a much-reduced cost, and it is now certain that the use of this material for motor purposes will increase rapidly.

The revival of wooden-ship building provides another use for wood. The large schooners now being built in America will require an average of about 1,250,000 superficial feet each; and as several hundred ships are proposed to be built, it is evident that a large amount of timber will be used. In Europe the restoration of buildings that have been destroyed in the war will make a heavy drain on both the forests of Europe and America. The foregoing matters are referred to in order to dispel the opinions that some may hold as the result of assertions that wood is becoming of less consequence owing to the use of substitutes.

New Enterprises.

It is satisfactory to find that some of the milling companies are embarking on new enterprises in connection with the utilization of their forests. Messrs. Ellis and Burnand have installed at their mill at Manunui machinery for manufacturing the now much-used three-ply. The same firm are also erecting a plant for rapidly seasoning timber by the most recent method—viz., enclosure in a chamber of hot air heavily charged with vapour.

The Marlborough Timber Company, who have acquired a large area of milling forest in Southland, are going to use the Lidgerwood overhead skidder for the transport of logs; by this system they will be able to work the bush more fully and at a cheaper rate than is generally the case with ground tram-lines and hawlers.

Forest Minor Industries.

In Europe, India, and America the forest is much more fully utilized than it is in new countries. In Europe turpentine, resin, tar, charcoal, pine, oils, and tanning are obtained from the forest; in fact, it may be said that in Europe the whole tree is used up. In this country however, a small amount of kauri-gum is the only secondary forest product obtained. As soon, however, as the financial pressure caused by the war is relieved it might be as well to make experiments in tapping kauri and other native coniferous trees for resin; and also to try the practicability of the extraction on a commercial scale of tannin-extract and dyes from various native trees. Further, bearing in mind how rapidly our native milling-timbers are being used up, it is desirable to experiment with some of our native timbers to test if by antiseptic treatment their defect of durability can be removed, so as to allow of their being used for purposes for which that defect now makes them unsuitable.

Forest Fires.

Forest fires are unfortunately the frequent accompaniment of the settlement of new countries, and this Dominion has in the past lost from this cause large areas of milling-timbers that would if now existing be of huge aggregate value. It is pleasing to record that last year, though in some districts droughts prevailed, the loss of native milling forest by fire was very small. To make the valuable Waipoua Kauri Forest more secure there are now three permanent Rangers kept there. It is hoped that by inserting warnings in the Press during the the summer months to make persons in outlying districts more careful in the matter of lighting fires.

New Forest Reservations and Withdrawals from Reservation.

During the year a total area of 25,950 acres was added to the State-forests reservation. Of this area, 11,350 acres were in Nelson Land District and 12,600 acres in the Southland District.

A total area of 194½ acres was withdrawn from reservation, 23½ acres being in the Taranaki District and 171 acres in the Marlborough District.

Waipoua Kauri Forest Demarcation.

In the spring a distinguished forest expert, Mr. D. E. Hutchins (late of the Indian and South African Forest Services) made a demarcation survey of the Waipoua Kauri Forest, but his report and plans have not yet been received. Mr. Hutchins is also reporting on the larger questions of the future treatment of our native forests and afforestation for New Zealand.

Forests are State Capital.

In the administration of forests it has sometimes been found that the residents of a district hold the opinion that the timber growing in that district is their special property, and should be exploited for their special benefit. This is an altogether wrong opinion, for the natural resources of a State are the capital of the State and should be treated in such manner as is to the best advantage of the whole population.

Return 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, 1917.

Heading.	Quantity.	Net Duty collected.*	Value.
Round logs—	Sup. Feet.	£	£
Ironbark	795,354	32	9,715
Other timbers	270,322	26	2,626
Hewn logs—			
Ironbark	1,623,969	155	22,865
Jarrah	157,780	..	2,042
Other timbers	1,829,661	80	19,795
Sawn rough—			
Ironbark	570,926	534	5,348
Jarrah	2,917,410	2,676	22,613
Oregon pine (Canada)	106,893	112	516
Oregon pine (U.S.A.)	3,577,847	3,696	11,832
Other timbers	7,422,186	7,916	83,641
Sawn, dressed: Miscellaneous	59,942	146	1,268
	Number.		
Laths	2,349,660	246	1,737
Palings, split	478,965	627	4,501
Rails, split	5,297	12	116
Posts, split	14,540	63	437
Shingles	215,300	24	185
Miscellaneous	..	17	1,666
	Tons.		
Tanning-bark	3,057	316	31,563
Totals	..	16,678	222,466

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

RETURN 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, 1917.

Heading.	Quantity.	Duty collected.	Value.
	Sup. Feet.	£ s. d.	£
Kauri	15,214,894	4 8 8	121,779
Kahikatea (white-pine)	44,769,516	..	216,202
Rimu (red-pine)	16,975,047	..	78,102
Beech (birches)	456,451	..	3,226
Miscellaneous (New Zealand)..	99,948	..	622
,, (not New Zealand)	7,807	..	111
Tanning-bark (New Zealand)..	46	..	421
,, (not New Zealand)	..	..	..
		4 8 8	420,467

APPROXIMATE QUANTITIES OF VARIOUS KINDS OF TIMBER IN LOGS DEALT WITH AT MILLS FOR THE YEAR ENDING 31ST MARCH, 1916.

(This table deals with logs cut at all mills, but excludes timber that has been resawn.)

Provincial District.	Number of Mills.	Kauri.	Rimu (Red-pine).	Kahikatea (White-pine).	Matai (Black-pine).	Totara.	Others and Undefined.	Total.
		Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.	Sup. Feet.
Auckland	67	49,707,738	32,414,280	47,764,697	1,684,071	9,624,146	12 324,667	153,519,599
Taranaki	11	..	3,424,157	1,491,334	208,661	31,921	600,000	5,756,073
Hawke's Bay ..	12	..	4,152,220	588,331	395,749	51,500	10,000	5,197,800
Wellington ..	31	..	21,494,086	11,196,215	7,919,793	781,489	2,631,437	44,023,020
Marlborough ..	5	..	1,683,518	563,955	193,419	46,987	10,836	2,498,715
Nelson	28	..	3,842,555	1,196,067	176,622	37,887	514,980	5,768,111
Westland	31	..	46,165,984	16,043,706	..	..	323,296	62,532,986
Canterbury ..	..	..	..	..	..	..	..	..
Otago	13	..	3,391,049	905,000	136,000	22,850	600	4,455,499
Southland	28	..	15,208,362	5,475,877	485,888	354,258	3,292,090	24,816,475
Totals for Dominion	226	49,707,738	131,776,211	85,225,182	11,200,203	10,951,038	19,707,906*	308,568,278

* NOTE.—Included in this total there are specified—Tawa 623,342 sup. ft., taraire 490,077, puriri 50,000, rata 31,300, silver-pine 18,000, pukatea 3,300, beech (called "birch") 5,710,060, yellow-pine 2,400, *Pinus insignis* 25,000.

EXTRACTS FROM REPORTS BY THE COMMISSIONERS OF CROWN LANDS.

AUCKLAND.

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

During the year the timber trade under the existing war conditions has been comparatively well maintained, and, notwithstanding the fact that the foreign trade has practically been suspended, the local, New Zealand, and Australian demand for timber has with few exceptions kept the whole of the sawmills fully engaged.

It has, however, been found necessary to close down most of the bush operations, owing partly to the exceptional increased log-supplies received through the unusual floods experienced during the past season, and partly to the scarcity of skilled bush labour. Although these log stocks are considered ample for present requirements, it is anticipated that there may possibly be a shortage before the end of the present year unless further supplies are obtainable during the summer months for those sawmillers who are more dependent on road traction than upon driving by water-power.

The increased demand by Australia for kahikatea timber is still very marked, and during the war period the export of this timber has constituted a record. If this heavy drain on the resources is maintained it is estimated that it will result in the supplies of kahikatea timber in this district being exhausted in about three and two-thirds years, so that the position in regard to this timber is one of considerable gravity.

Great difficulty is now being experienced by sawmillers in obtaining skilled labour both in their bushes and mills, with the result of lessened productions tending to an increased cost.

A temporary set-back to the butter-box and timber trade was caused through the destruction by fire of six large sawmills and box-factories in the Northern Wairoa district, King-country, and at Auckland, all within the period of a few months. With only two exceptions, however, all of these mills are again in course of re-erection.

Since the issue of the last timber-industry report several large and costly modern sawmills have been erected in various parts of the district; and it is generally anticipated that there will be a large increase in the overseas demand for New Zealand timbers in the near future, more especially as regards Australia, which depends largely upon this country for its supplies of soft woods.

Milling operations have lately been commenced by the Railway Department in the State-owned forest at Mamaku, where an abundant supply of superior mountain rimu is available with an easy access to the railway. The possession of this forest should prove a great advantage to that Department, as it will supply its requirements as regards that class of timber.

At present there are sixty-eight sawmills in operation in the Auckland District, with an output for the past year as follows: Twenty mills cutting kauri timber, output approximately 52,000,000 superficial feet; twenty mills cutting white-pine (kahikatea), output approximately 70,000,000 superficial feet; and twenty-eight cutting rimu and totara, output approximately 60,000,000 superficial feet. The number of hands employed at these mills is stated to be approximately 2,100 men.

As shown hereunder, the retail prices of sawn kauri timber have steadily been rising since 1910:—

Kauri Timber.—From 3 in. to 12 in. wide, undressed, up to 24 ft. long, $\frac{3}{4}$ in. to 1 in. or more thick, per 100 superficial feet:—

	First Class.		Medium.		Second Class	
	s.	d.	s.	d.	s.	d.
December, 1910	24	0	18	6	12	0
November, 1912	28	0	22	6	14	0
March, 1917	32	0	25	0	16	6

As regards the increase in prices of other kinds of timber the following may be taken as a fair indication:—

Rimu Timber.—Heart timber, dressing quality: May, 1912, 18s. 6d. per 100 superficial feet; November, 1912, 22s. per 100 superficial feet; December, 1914, 25s. per 100 superficial feet; April, 1916, 28s. per 100 superficial feet. A further increase on the last price is now under consideration by the sawmillers.

Closer attention is being given by the sawmillers to the utilization of some of the native timbers which were formerly rejected, chief amongst these being taraire and tawa. More especially is the former timber now being sought after throughout the Dominion for mouldings and furniture-making, and it is largely supplanting the imported oak timber for these purposes. Two mills are principally engaged in cutting this timber, and a third mill is now in course of construction.

Some of the larger timber companies are now turning their attention to the tawa timber for box and fruit-case making, and a larger demand for this timber is anticipated in the near future on account of the higher prices obtained for other second-class timbers making them too expensive for fruit-cases.

During the past three years the Crown forests have been immune from fires, but last year one or two fires took place in some of the privately owned kauri forests, which will necessitate the early working of this timber to avoid the loss in sapwood.

It may be of interest to note that, with the view to economizing in the costly laying of tramways, two of the larger timber companies have installed in their bushes an improved imported log-hauler and gear capable of hauling over a radius of two miles, as compared with the older type, which averaged about 20 to 30 chains haulage.

The following table shows in superficial feet the various kinds of timber disposed of during the year ended 31st March, 1917:—

——	Kauri.	Rimu.	Kahikatea.	Totara.	Matai.	Miscellaneous.	Total.	Amount realized.
								£ s. d.
Crown lands and lands for settlement	474,424	10,523,269	1,238,788	340,646	325,663	1,530,941	14,433,731	10,389 3 7
Education reserves ..	91,661	111,536	593,881	22,903	2,246	56,363	878,590	410 14 9
Totals	566,085	10,634,805	1,832,669	363,549	327,909	1,587,304	15,312,521	10,799 18 4

The total amounts received as royalties during the year were for timber cut from—Crown lands, £4,599 6s. 9d.; State forests, £4,734 16s.: total, £9,334 2s. 9d.

There have been three parties of timber-measurers engaged in measuring and inspecting timber during the year, and the following are the total quantities of all kinds of timber measured by them: Total, 26,811,294 superficial feet, at an average cost of 1·081d. per 100 superficial feet.

Hawke's Bay.

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

As far as the southern portion of Hawke's Bay Land District is concerned the whole of the marketable milling-timber may be considered as practically cut out. During the last ten years most of the mills have been closed down. The mills now being worked are in places difficult of access owing to bad roads and distance from markets.

The number of mills working is sixteen, but they are mostly small plants, and are not working continuously. The timbers milled were mostly rimu and kahikatea (white-pine), of

which the output during the year has been 680,000 ft. of rimu and 280,000 ft. of white-pine, or an average monthly output of 80,000 superficial feet.

The net wholesale prices at present charged by timber-merchants in Napier are 14s. per hundred superficial feet for rimu and white-pine, and 28s. per hundred superficial feet for heart of totara.

Owing to an exceptionally wet season there have been no fires of any consequence during the last twelve months. Two years ago the forest at the back of Ngamoko, in the Norsewood district, was damaged to some extent from fire.

As regards the northern portion (Poverty Bay) of the Hawke's Bay Land District, it may be stated that for the past twelve months the sawmills have been cutting to their full capacity, as the building trade was very brisk both in town and country. There are four sawmills operating in the Motu district and one at Te Karaka, and up to the present they have all been kept busy.

The Motu mills are working under somewhat different conditions. One mill only loads on the railway-trucks at Matawai, while the other three have to load at Kowhai Road, and rail about five miles to Matawai on the section of the Public Works line, on which section they have to pay a freight of 8d. per hundred, making a total freight to Gisborne of 2s. 8d. per hundred for a distance of under fifty miles. Rimu is the chief timber used for building purposes, and there is only a limited demand for white-pine locally, the bulk of the pine being exported to Sydney. The export trade has been considerably handicapped by the high railway rates, as the freight here on white-pine is the same as on other timbers, whereas on other railway-lines there is a concession on white-pine for export.

The cost of production during the year has been considerably higher than for the preceding year. This has been made up partly by increased rates of wages, and also by increased cost of wire rope, oil, grease, and all other milling requisites, and the mills have had to raise their prices accordingly. There is also a great difficulty in securing efficient workmen, especially bushmen.

The five sawmills working in this district cut 5,740,000 superficial feet last year, comprising 3,400,000 ft. of rimu, 2,100,000 ft. of white-pine, and 240,000 ft. of matai, birch, and totara.

The prices charged in March by timber-merchants in Gisborne were—For rimu, clean ordinary building (green), 21s.; clean heart (green), 27s. 6d.; totara, clean heart (green), 42s. 6d.; matai, clean heart (green), 31s. The above prices are subject to 10-per-cent. discount to builders, and are per 100 superficial feet.

The question of the duration of supplies depends on so many conditions that it is impossible to give more than a guess, but I should say about fifteen years.

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

The total amount of royalties received for timber cut on Crown lands was £17 15s., and from State forests nil.

Taranaki.

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

The timber industry in the Taranaki Land District is in a comparatively small way. In different parts of the district there are about eight mills working. Of these only four at present are working on Crown land or State forests, but they also mill timber from other lands adjacent.

The bush in this district does not on the average contain a large quantity of timber per acre convertible for milling purposes, and it is only in comparatively small areas that contain about 5,000 ft. to the acre and where handy to railway or good roads, that it pays to mill. The bush generally will not average that.

A lot of the country is so rough and inaccessible that the small average quantity of timber over it would not pay millers. At the same time inquiries are occasionally being made for quantities worth the while and at all handy. The modern use of steam log-haulers enables millers to draw timber out of very rough places. The average working-capacity of the different mills from inquiries made seems to be about 700,000 superficial feet of all timbers per annum for each, but this total was not reached last year owing to the shortage of labour, and it is not possible to give the total output, as most of the timber cut was from privately owned land. The largest portion of the output here, probably 78 per cent., consists of rimu; of the rest about 15 per cent. kahikatea, with very small percentage of miro, matai, and totara.

It is probable that less than 30,000,000 ft. will exhaust most of what is considered as available on Crown land worth holding back for timber in this district. The probable duration of the supplies in the Taranaki District will be about ten or twelve years; after that only very small patches of native timber will be available.

It is not known that any timbers formerly rejected are coming into use to any great extent; pukatea is sometimes sawn up, but the supplies of such are very small.

In dry seasons fires keep nibbling into the green bush, and this helps to diminish the supply. It is possible that tawa could be utilized for some purposes, such as cases, &c.

The amount received as royalties during the past year is as follows: From timber cut on Crown land, £487; from timber cut on State forests, nil.

Wellington.

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

All reports received on the timber industry in this district describe it as being in a depressed condition, with little prospect of its improvement in the immediate future. As all speculative enterprise in building has come to a standstill owing to the adverse factors caused by the con-

tinuance of the war, the increasing scarcity of skilled labour, and the greatly increased cost of all building-material, there exists a demand only for such timber as is needed for urgent requirements. Furthermore, owing to a large proportion of the younger and more skilled mill employees having been absorbed in the Expeditionary Forces, the millers are confronted with the increasing difficulty of carrying on their operations with older and less efficient workers, and with a consequent increase in cost.

However, notwithstanding the difficulties contended with, there appear to be about sixty sawmills cutting at present in this district on Crown and private lands. About fifty-five of them are situated in the north-western part of the district, to the north of Taihape.

It is difficult to collect particulars of the output of each variety of timber. Thirty-two of the mills along the North Island Main Trunk Railway are said to be cutting altogether about 4,270,000 superficial feet per month, principally rimu and matai; about nine mills in Taihape district produce a total of about 104,000 superficial feet per month, two-thirds of their output comprising rimu and kahikatea.

Very little milling is now going on in the Wairarapa or that part of the Wellington District situated east of the Tararua Ranges. As all the easily available timber has been cut out, only one or two small mills remain in operation there catering for requirements in their immediate vicinity.

During the year the total amount of royalty received from sale of timber was as follows: From timber cut on Crown land, £7,337 14s. 4d.; from timber cut on State forest, £128 11s. 6d.: total, £7,466 5s. 10d.

It is estimated that in the most northern part of the district it will take from fifteen to twenty years is cut out the remaining milling-timber at normal rate of cutting; further to the south what is now available will probably be exhausted within the next eight to ten years.

Although millers are said to be now cutting timber in localities where such would formerly have been regarded as unprofitable, they do not appear to be cutting any of the particular varieties hitherto regarded as being unmarketable.

Notwithstanding the prolonged duration of the dry season recently no material damage has been caused to milling bush by fires.

Eleven lots of milling-timber, comprising about 100,873,000 superficial feet, have recently been withdrawn from application with the view of amending prices in conformity with the increased royalties recently fixed by regulations, and of reoffering as occasion requires.

Nelson.

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

As conditions vary somewhat with the different localities it will be found desirable to consider the question under three cases.

(A.) In the northern portion of the district the cutting is practically confined to freehold lands, and the areas therein available are comparatively small and scattered. For the more valuable kinds of timber, therefore, such as rimu, kahikatea, matai, and totara, cutting can hardly last more than five years at the present average rate of conversion. There will certainly still remain a very considerable area of good birch of black and brown species. At present, however, birch is not much in demand, and other timber is now being brought here for conversion from Pelorus Valley, either by sea or by forty miles of wagoning. These circumstances, combined with increasing inaccessibility and difficulty of marketing such timbers as remain, and to some extent the prevailing war conditions of labour, make milling operations in the above locality unsatisfactory.

The timber industry on the whole is thus far from flourishing. During the year eight mills closed down, leaving twenty-four in active operation.

It has been impossible to obtain a reliable statement of output from mills working on private lands.

The destruction of millable bush by fires was practically inconsiderable during the past year.

(B.) In the Reefton district there are seven mills in active work, operating almost wholly on Crown lands. The output ascertained was about 2,700,000 superficial feet, showing a falling-off of, say, 600,000 superficial feet. The present year's output is made up as follows: Rimu, 2,000,000 ft.; birch, 700,000 ft.; silver-pine, about 10,000 ft.; and totara, under 2,000 ft.

The more valuable classes of timber, such as rimu, may stand fifteen years' milling, and the birches, as elsewhere, very considerably longer. Silver-birch, formerly rejected, is coming into use.

A considerable amount of damage has been done in the aggregate by fires during many years past; usually no considerable area has been burnt in one year owing to the wet climate, but last year fires ruined only an inconsiderable area of fair milling-timber. Owing generally to shrinkages of forest milling areas and to stress of labour conditions, the industry has considerably declined.

(C.) In the Buller County some five mills appear to have practically closed down, leaving nine mills in active work. The principal timber now being cut is rimu. Kahikatea is found now only in small patches about the gullies. Brown and silver birch are found in abundance, but are becoming somewhat difficult to work. Just at present no milling is going on at Karamea owing to the uncertain nature of the bar harbour.

Although during the past season several tram-lines and fences were damaged by fires, yet but very little standing milling bush has suffered. The output of timber so far as can be actually ascertained is—Rimu, about 2,500,000 superficial feet; and kahikatea, 50,000 superficial feet.

The total number of sawmills in active work in the Nelson District is forty.

The total output for the year for the Nelson District was 5,000,000 superficial feet of rimu, 1,000,000 of birch, 10,000 of silver-pine, 2,000 of totara, and 50,000 of kahikatea.

There were no royalties received from State forests, but from timber cut on Crown lands £642 12s. 4d. was received as royalties.

The net wholesale prices charged by timber-merchants in March were—for matai, 20s.; kahikatea, 16s.; totara, 28s. to 32s.; brown-birch (beech), 10s. to 24s.; silver-birch (beech), 9s. to 10s. per 100 superficial feet.

Timbers formerly rejected but now being used are brown and silver birch (beeches).

Fires have done no appreciable damage to the milling forests.

Marlborough.

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

The demand for timber throughout the year has been good, but owing to the scarcity of efficient labour the output has been considerably less than in recent years.

Eight sawmills are operating in this district, with an output of 7,000,000 ft., comprising 4,500,000 ft. of rimu, 2,000,000 ft. of kahikatea, 300,000 ft. of matai, 200,000 ft. of birch, and 10,000 ft. of totara.

Royalties from timber on Crown land, £195 17s. 9d.; royalties from timber on State forest, £759 5s. 1d.: total, £955 2s. 10d.

The wholesale prices charged for timbers are—Rimu, 11s. per 100 superficial feet; kahikatea, 10s.; matai (R.H.), 14s. 6d.; matai (C.H.), 16s. 6d.; birch, 21s.; totara, 38s.; with 2s. to 2s. 6d. extra for dressed timber.

The probable duration of present supplies of different milling-timbers is ten years.

Birch is being more largely cut than hitherto.

Only a small area of forest in the Opouri Valley has been destroyed by fire.

Westland.

(Thomas Brook, Commissioner of Crown Lands.)

During the past year the sawmilling industry has been carried on under many difficulties, the most serious one being the lack of suitable labour. While this trouble has not been so serious as to necessitate the closing of mills, it has added considerably to the cost of production, and is no doubt responsible to a great extent for the increase in the price of timber. The uncertainty with regard to securing shipping-space was the cause of a good deal of anxiety, but although occasional delays have occurred the output has been got away without any serious congestion at the mills. The total quantity of sawn timber produced during the year was 50,211,000 ft., or about 2,000,000 ft. in excess of the previous year, and as practically the whole of this has been shipped the result must be regarded as very gratifying considering the present extraordinary demand for shipping.

All classes of timber are now in good demand, white-pine in particular being eagerly sought after. Australia is a very good market, this no doubt being the result of the cutting-off of supplies from Europe and America.

There are now thirty-eight mills in operation in the Westland Land District. One small mill closed down during the year, and a large one is in course of erection on Lake Haupiri. Of the total output, 36,091,000 ft. was obtained from Crown and 14,120,000 ft. from private lands. Rimu and white-pine constitute nearly the whole of this, and, although the exact figures for these two classes cannot be given, 40,800,000 ft. of the former and 9,300,000 ft. of the latter may be accepted as approximately correct.

The amount received in royalties from Crown land is £8,186 2s. 11d., but this does not include royalties, which are deemed to be goldfields revenue as provided for in section 148 (*a*) of the Mining Act. A further sum of £1,412 19s. 1d. was received as rent from areas held under timber-cutting licenses.

The quantity of timber used locally is so small as to be almost negligible, and price-lists are not issued. Practically the whole output is sold under contract in the large centres. When comparing the prices obtained in the various markets the peculiarities of each must be considered. Christchurch pays a high price for first-class timber, but it demands a very high quality, and is a poor market for inferior grades. The sale of the latter being one of the difficulties which the miller has to overcome, it can readily be understood that the market which furnishes the highest price is not necessarily the most profitable one, either for the miller or the State. The inability or neglect to find a market for inferior timber has been the cause of much loss in the past, and it is pleasing to be able to record an earnest endeavour by some sawmillers to remedy this.

The milling-timber in Westland is widely scattered throughout the district, and a large proportion is too difficult of access to be worked under present conditions. At the present rate of cutting the accessible supplies should last for twenty years.

About 100,000 ft. of brown-birch was converted during the year, and there is a tendency towards its more extended use. Silver-pine sleepers are in good demand, but the best of this valuable timber has already been worked out.

Westland is exceptionally free from destructive forest fires. Last summer was very dry, and log-fires destroyed tram-lines in various localities, but there was no loss of standing timber.

Canterbury.

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

The timber industry has practically ceased so far as Canterbury is concerned. There is one mill which works spasmodically when orders arrive and when the licensee can secure men to work the bush. *Fagus solandri* (entire-leaved beech) is the only timber cut. There are two or three travelling mills cutting *Pinus radiata* and *Eucalyptus* from out of plantations for local requirements, and a few splitters in old workings and burnt forests producing fencing-posts and stakes, otherwise the public are using imported timber for buildings, bridges, wharves, and fencing. Kauri from Auckland, pine from the west coast of the Island and Marlborough, Oregon pine, and jarrah are extensively used for buildings; iron-bark, jarrah, Tasmanian hardwoods for bridges, wharves, &c.

The royalty received from timber cut on State forests was £16 15s. 3d., and from Crown lands nil.

The present market prices for timber are: New Zealand timber—Rimu, unseasoned, 23s. 9d., per 100 superficial feet; dressed weatherboards, 28s.; flooring, 31s. (these prices are approximately 3s. per 100 ft. above the ruling values in 1915); white-pine, according to sizes, 25s. to 29s.; black-pine, 33s. (mostly flooring); totara, 35s. to 40s.; kauri flitches, 40s. 6d.; dressed flooring, 45s. Foreign timbers—Oregon pine, for lengths over 30 ft. and under 40 ft., 31s. 6d.; over 50 ft., 33s. 6d. to 38 ft.: jarrah, under 25 ft., 40s.; 25 ft. to 30 ft., 42s.: Tasmanian *eucalyptus*, stock sizes, 28s. per 100 ft. All the before-mentioned prices are subject to 5-per-cent. reduction to builders and contractors, and a further 2½-per-cent. discount for cash payments.

All the available native timber which can be profitably worked except a little in the reserves and plantations has been exhausted, and until the West Coast Railway is completed supplies for the public will have to be brought oversea.

During recent years only an occasional fire has scorched the fringes of some of the forest reserve in the back country. The front reserves have not suffered any damage recently.

In view of the rapid consumption of kahikatea and tawa for butter and cheese casings, it may be desirable to plant tasteless and rapid-growing timber as substitutes for these vanishing woods. There are large areas of waste and unprofitable land in Canterbury which could be utilized for such a purpose without encroaching on fertile land or putting what is now producing out of action.

Otago.

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

The timber industry in Otago has suffered a set-back to some extent through the influence of war conditions. None of the mills has actually stopped working, but, on the other hand, no mill is working to anything like its full capacity. The slackness in the building trade is no doubt accountable for this, and the serious shortage of first-class labour has also an important bearing on the position. The price of timber, following on the formation of a sawmillers' association, has been raised to some extent, but probably the most direct effect of the association was to distribute more equally the orders coming to hand.

There are ten mills of various sizes working in Otago at present, and these are all in what is known as the Catlin's Bush (at the extreme southern end of this land district), which comprises parts of the survey districts of Glenomaru, Catlin's, Woodland, Tautuku, and Rimu. Though the bush being worked might be generally described as mixed, the principal timber is rimu (red-pine). Matai (black-pine), kahikatea (white-pine), and miro are also worked in smaller quantities, but their proportion in the native bush is smaller. To give the output during the year of each class of timber would necessitate a visit to each mill, and would delay this report for some time. It might even then be very difficult to obtain reliable figures from the sawmillers. It may, however, be concluded that the output of rimu is equal to that of all the other timbers put together, and taking that as a basis in conjunction with the output of each mill, the following would closely approximate the yearly production in superficial feet: Rimu, 4,000,000; matai, 1,000,000; kahikatea, 250,000; miro, 1,750,000; totara, 100,000; beeches, 900,000: or a total of 8,000,000 superficial feet.

No fires have taken place in the bush in Otago during the past year. It would be very difficult for a fire to run through any extent of the bush in the Catlin's district because of the wet nature of the climate and soil. Occasionally a burning moss-bank—and some of these continue to smoulder and burn for a considerable time—may destroy a few trees, but such does not extend over any very great area. In the Lakes district much destruction was done by fires in the beech bush in years past, but the native forest there was generally on dry hillsides subject to a dry climate, where fire would carry much more readily.

During the past very little attention has been given by sawmillers to the various beeches. Lately, however, this timber is being more extensively used. The fruit-growers will probably be forced to use it more and more in the future as the supplies of white-pine run short. Beech is somewhat heavier than white-pine, and that seems to be the chief reason why its use in fruit-cases is not more general.

There seems to be an inclination in bush districts to agitate for the immediate cutting-up and disposal for settlement of all bush reserves and unsurveyed bush lands. The result of settlement in virgin bush is to destroy much valuable timber in order to clear the land for grass. In view of the very great value of timber and the prospect of an early shortage of supplies, it would seem to be a great pity to destroy a single tree that can be turned to sawmilling account. To

let the sawmiller have the bush first and when he has taken all that is profitable to give it to the settler would seem to be the most economic policy, and when it is remembered that in the Catlin's Bush alone some millions of feet of the very finest timber has been felled and burned to make way for grass, such a policy is more deeply impressed on one. Moreover, most of the bush would produce much more revenue from timber royalties than could be expected from the settlers, while from the settlers' point of view the land without the heavy timber-trees is so much more easily cleared. The revenue from timber royalties would probably produce sufficient money to pay the cost of survey and roading.

The royalties received were—for timber cut from Crown lands, £443 13s. 10d.; from State forests, nil.

The present net wholesale prices charged in Dunedin for timber are—for rimu, 12s. 6d. to 19s.; miro, 12s. 6d. to 16s. 6d.; matai, 16s. 8d. to 23s.; kahikatea, 16s. 6d. to 19s.; totara, 25s. to 31s.; beech, 12s. 6d. to 21s.: all at per 100 superficial feet.

SOUTHLAND.

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

Owing to lack of orders, the shortage of labour, and the high cost of all materials, the sawmillers in this district have experienced a very trying year. Some demand sprang up for supplying the Australian market, but the lack of shipping has interfered with this prospect.

Two large and up-to-date mills are being established at Mussel Beach, in Rowallan Survey District, which will break new ground as far as Southland is concerned, the site being twenty miles beyond the nearest settlement. I understand that the proprietors of these mills intend to use their own vessels for shipping the timber, but returns from this source will not come in till next year.

The number of mills worked during the year was forty-one, and the output was the smallest for the past thirty years—viz., between 24,000,000 and 25,000,000 superficial feet, comprising the following timbers: Rimu and miro, 19,305,000; white-pine, 2,722,000; beech, 1,980,000; black-pine and totara, 742,000.

The royalties received were—from Crown lands £1,356 14s. 3d., and from State forest £1,700 4s. 11d.

The wholesale prices of timbers in Invercargill were—for red-pine (rimu) ½ in. and under up to 8 in. wide, 11s. 9d.; scantlings and up to 8 in. wide, 15s.; heart up to 10 in. wide, 20s. 6d.; clean ditto, 22s. 6d.: black-pine (matai), 6 in. by 1 in. T. and G., 24s. 6d.: totara, 8 in. by 3 in. and under, 23s. 6d.; clean ditto, 26s. 6d.: white-pine (kahikatea), 12 in. and over, 13s. 9d. Five per cent. discount is allowed on these prices, which are per 100 superficial feet.

The above are the milling-timbers now used, but there is no doubt that beech will come much more into use and take the place of red and white pine as those timbers become scarcer. The beech now being used was considered a useless timber twenty years ago.

Owing to the high and well-distributed rainfall there is little danger of any virgin forests being destroyed by fire in this district.

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