

SESSION II.
1921.
NEW ZEALAND.

STATE FOREST SERVICE

REPORT FOR THE YEAR ENDED 31ST MARCH, 1921.

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

THE DIRECTOR OF FORESTRY TO THE HON. THE COMMISSIONER OF STATE FORESTS.

Wellington, 1st August, 1921.

SIR,—

I have the honour to submit herewith a report on the work of the State Forest Service for the year ended 31st March, 1921.

I have, &c.,
L. MACINTOSH ELLIS,
Director of Forestry.

The Hon. Sir F. H. D. Bell, K.C.M.G., K.C.

CONTENTS.

	PAGE		PAGE
Chapter I.—Progress of New Zealand Forestry ..	1	Chapter IV.—Research and Experiments—	
Chapter II.—The State Forest Service ..	3	Forest Economics	8
Chapter III.—The State Forests—		Forest-management	9
Constitution of State Forests ..	3	Chapter V.—General—	
Finance	4	Timber Trade Conditions	10
Management—		Empire Forestry Conference	11
Timber	6	Forest Atlas	12
Grazing	7	Forest Service Library	12
Game and Recreation	7	Chapter VI.—Recommendations ..	12
Forest-protection	7	Annexures	13
Afforestation and Forest-extension ..	8		

CHAPTER I.—PROGRESS OF NEW ZEALAND FORESTRY.

NEW ZEALAND is now in the third “forestry boom,” the first one dating back to the year 1874, when the self-same symptoms and fears of timber famine were expressed as are being voiced at the present time. The positions are parallel, but with the important difference that to-day the Parliament, Press, and people are beginning to appreciate the meaning of timber-conservation and national forestry. This growing interest has found expression during the year in a definite forest policy, the creation of an administrative instrument, the Forest Service, and the additional dedication to technical management of forest and woodlands which now bring the total up to 6,800,000 acres.

The year under review may be considered as the year of stocktaking, of orientation, and of study of the conditions and problems incident to a sound and businesslike administration, and of the procedure and *modus operandi* necessary to forest-management. The year ending 31st March, 1922, will be known as the year of establishment and of application, whilst the year ending 31st March, 1923, may be known as the year of fruition and results.

During 1920-21, a study was made of the quantity and distribution of the indigenous forests of the State; of afforestation activities; of New Zealand methods of forest administration and application by the Lands Department; of the sawmilling industry, domestic consumption and exportation of timber; of the silvical and ecological problems attendant on the regrowth of the indigenous forests, and of many other factors incident to timber and timber use.

The period April to August was spent by the writer in studying forest milling and industrial wood-consumption throughout the Dominion. In September a comprehensive survey traversing the whole field of forestry and forest activities was prepared and presented to the Minister in Charge of Forestry. After a deliberate consideration of the report a plan of administration was approved and steps were taken to bring into being the State Forest Service.

The central management and administrative control of the service briefly consists of the Director of Forestry (assisted by the Chief Inspector) and the Secretary, with offices at Wellington.

As decentralization and efficient stewardship go hand in hand it was decided to establish seven forest-conservation regions, each in charge of a competent regional executive, the Conservator of Forests. The conservation region is divided into several ranger districts, each in charge of a Forest Ranger who functions as local executant as regards cruising and appraisal of timber-sales, trespass, forest-protection, and generally all activities relating to the State forests. Provision was also made for the appointment of an Engineer in Forest Products, a Milling Expert, Surveyors, and the necessary clerical assistance.

It was not until the end of the year that the necessary appointments were made. At that time a Conservator of Forests was appointed for the Auckland, Rotorua, Westland, Canterbury Otago, and Southland Regions. Owing to financial difficulties the posts of Conservator of the Wellington and Nelson-Marlborough Regions were held in abeyance. Forest Rangers to the number of twenty-four were appointed to various forest districts throughout the Dominion, and the posts of Engineer in Forest Products, Milling Expert, and Land Surveyor were filled. The necessary forest clerks were also secured and assigned to the Conservators' offices. The Forest Service has been fortunate indeed in securing from a wide range of applicants a very fine personnel, and it is hoped that the high standard of efficiency that has been set and inaugurated will be continuously maintained.

In January the Minister in Charge of Forestry presented to the public a statement of forest policy by the execution of which it is hoped to attain the conservation and reasoned use of our visible timber-supplies and the perpetuation of the use of the national forest estate for future generations. This policy is based on the conviction that the forests of New Zealand are for the use of the people of New Zealand, and that while the present is entitled to the fullest economic use of this resource it behoves the present to so handle this heritage that the rights of posterity are safeguarded. The policy briefly calls for—

- (1.) Permanent dedication to Forest management of all Crown forested lands chiefly valuable for forestry and timber-production, and the deletion from State forests of all lands chiefly valuable for agricultural purposes as soon as possible :
- (2.) The subjection to scientific Forest management of all State forests, and the placing of same on a sustained-cut basis :
- (3.) Establishment of protection forests at the head-waters of streams, on water-supply basins, &c. :
- (4.) Application of an efficient scheme of forest-protection to State forests :
- (5.) The gradual building-up of an efficient administrative instrument—the State Forest Service :
- (6.) Establishment of a School of Forestry for the training of forest technicians :
- (7.) Promotion of forest research :
- (8.) Forest-extension by the State planting in those regions where demonstrated results are best and the local needs most urgent :
- (9.) A progressive timber-sale policy :
- (10.) Decentralization, and the settlement of all local questions by local officers.

This expression of policy, which has been very well received by producers, consumers, and the general public, forms a splendid base upon which to build the new Forest Act so urgently required.

THE NATIONAL FOREST ESTATE.

The forest reconnaissances which were made during the year, of the mountainous backbone of the North Island from the East Cape to Parks Peak, and of the eastern slope of the Southern Alps, emphasize the grave danger of opening up to reckless settlement the high forested uplands and wooded ranges of the Auckland, Taranaki, Wellington, Hawke's Bay, Nelson, Marlborough, Westland, Canterbury, Otago and Southland Provinces. The vital social interests of New Zealand, her national welfare and economy, demand the reservation from further devastation and destruction of all the hundreds of thousands of acres of these protection forests. Surely this beautiful Dominion does not mean to repeat the history of Mesopotamia, Greece, Italy, Spain, France, Portugal, China, and other countries in pastoral and agricultural disaster ?

The time to begin rational forest-management is when you have forests to start with. "Do not lock the stable-door after the horse is stolen." There are at least 4,000,000 acres of undedicated Crown and Native forest land that should be subjected to rational conservation, reasoned use, and silvicultural control in the interests of the national well-being.

CHAPTER II.—THE STATE FOREST SERVICE.

During the year a complete revision of the remuneration and grading of the Service personnel was accomplished. The scale of salaries and allowances paid to the public servants engaged on responsible activities of forest extension was absurdly low when compared with operations of an equivalent value and responsibility in other branches of the New Zealand Public Service and in other countries. These unequal conditions were remedied, appropriate classifications were established, and to-day it may be said that the salaries and status of the Forest officers are on a basis commensurate with their duties, responsibilities, and obligations. The writer is confident that the standard of efficiency now prevailing in this instrument of State business is equal to that of the best commercial standard in this or any other country. But the State must be prepared—if it expects to have this high level maintained—to pay for their devotion, loyalty, and efficiency just as commercial organizations must pay for it.

The augmented staff of Forest officers concerned with the management, protection, and development of the indigenous forests has begun work with enthusiasm and determination. It is to be hoped that as the knowledge, experience, and effectiveness of that Forest Service staff increases to greater usefulness the “go-getters” will be substantially recognized before they are lost to the Public Service.

The following table shows the Forest Service organization at the 31st March, 1921:—

FOREST SERVICE ORGANIZATION.—DISTRIBUTION OF TOTAL FORCE, NEW ZEALAND STATE FOREST SERVICE, AT 31ST MARCH, 1921.

Forest-conservation Region.	Director.	Secretary.	Chief Inspector.	Conservators of Forests.	Special Officers.	Forest Assistants.	Surveyors.	Clerical Staff.	Draftsmen.	Senior Forest Rangers.	Forest Rangers.	Forest Guards.	Nurserymen.	Timber-measurers.	Others.	Total.
Auckland ..	..	..	..	1	..	..	..	1	..	1	3	..	..	2	..	8
Rotorua ..	..	..	..	1	..	..	1	3	..	1	6	4	3	..	1	20
Wellington ..	..	..	..	..	..	..	..	1	..	2	3	..	..	..	..	6
Nelson ..	..	..	..	..	..	..	..	1	..	1	5	..	..	..	..	7
Westland ..	..	..	..	1	..	..	..	1	..	1	4	..	..	..	..	7
Canterbury-Otago ..	..	..	..	1	..	..	..	3	..	2	2	3	7	..	..	18
Southland ..	..	..	..	1	..	..	..	1	..	1	4	..	..	..	..	7
Central Office ..	1	1	1	..	2	1	1	12	5	..	..	..	..	..	..	24
Total ..	1	1	1	5	2	1	2	23	5	9	27	7	10	2	1	97

CHAPTER III.—THE STATE FORESTS.

1. CONSTITUTION OF STATE FORESTS.

The area of State forests, 1,666,302 acres, was increased by 20,111 acres during the year, making a total of 1,668,319 acres; while the area of provisional State forests, which embraces 3,293,372 acres, was increased by the dedication of 1,840,321 acres to a total at the 31st March, 1921, of 5,134,651 acres.

Not one acre of Crown forest lands has as yet been dedicated provisional State forest under the empowering legislation of 1918 in the land districts of Wellington and Canterbury, although there are several hundred thousand acres of forest areas that might be profitably gazetted as such.

The grand total area of State forests and provisional State forests that is now under the management of the Forest Service is 6,802,970 acres, or 10·3 per cent. of the superficial area of the Dominion. The systematic investigation of this acreage will disclose the fact that at least 50 per cent. of the area can only be classified as protection woodland and subalpine scrub.

Forest Reconnaissance of the Eastern Slope of the Southern Alps.

During the year a general forest reconnaissance was made of the forested lower slopes of the eastern side of the Southern Alps from Te Waewae Bay, through Southland, by Lake Wakatipu, through Otago, Canterbury, and to the headwaters of the Wairau River in Marlborough. The purpose of this survey was to determine the general quantity and quality of the forest growth, the damage by fire, agencies causing same, methods of control, extent and effect of grazing, regional distribution of the various forest groups, and the relation of the upper watershed forests to the water resources of the plains of Canterbury and Southland.

This survey demonstrates the serious influence of upland deforestation as regards hydro-electric development, irrigation needs, municipal water-supply, regulation of stream-flow, and stabilization of the climatic balance on the lower fertile plains. There are over 330,000 acres of undedicated protection forest which should be proclaimed State forest and brought under the Forest Service control. The future well-being of the eastern side of the South Island requires that all the residual upland forests be saved from further denudation and destruction without delay.

Forest Reconnaissance of the Huirarau-Raukumara Ranges.

A general forest reconnaissance was made of this mountainous backbone during the year. The purpose was to ascertain the economic relation of the forests of this important massif to the prosperous and populous Hawke's Bay, Gisborne, and Bay of Plenty districts. The investigators report: "In this region the effects of the removal of the forest cover are so apparent that the value of the forests as protective agents is stressed, and in order to prevent further irremediable damage the remaining areas under forest cover should be maintained as permanent State forests."

The prevention of slips and landslides, silting and blocking-up of rivers and harbours, the washing-away of fertile plains, if nothing else, demand the conservation in perpetuity of these widespread protection forests.

Your Director seriously recommends the dedication without delay of 600,000 acres of protection and commercial forest to permanent Forest control, in and through the counties of Whakatane (including 250,000 acres in the Urewera), Opotiki, Waiapu, Waikohu, and Wairoa—primarily in the interest of the depending agricultural communities, as well as in the interest of subordinate timber-supplies.

Kauri Park—a National Souvenir.

During the year negotiations were practically completed for the acquisition of 908 acres of kauri forest near Dargaville from Mr. James Trounson. The grateful appreciation of the people of New Zealand is due to this gentleman for the exceptional terms upon which he has sold this magnificent forest to the Crown. It will stand for centuries as a glorious but vestigial souvenir of what was once a great example of Nature's handiwork—the unequalled kauri forests of the North. Gone for ever is this great heritage of the people, sold and destroyed for a mess of pottage. Let this remnant stand as a reminder of how not to use our remaining forest wealth.

2. FINANCE.

STATE FORESTS ACCOUNT.—RECEIPTS AND PAYMENTS ACCOUNT AT 31ST MARCH, 1921.

[illegible]

L. MACINTOSH ELLIS, Director of Forestry.
A. W. GYLES, Accountant.

The statement has been examined and agrees with the total receipts and expenditure as disclosed by the Treasury accounts.—ROBERT J. COLLINS, Controller and Auditor-General.
5th October, 1921.

STATE FORESTS ACCOUNT.—LOAN ACCOUNT AT 31ST MARCH, 1921.

To Local authority—	£	By Debentures issued—	£
Section 50, Finance Act, 1916 ..	50,000	1916-17—Section 50, Finance Act, 1916 ..	10,000
Section 32, Finance Act, 1918 (No 2) ..	200,000	1917-18—Section 50, Finance Act, 1916 ..	28,100
Section 16, Finance Act, 1920 ..	250,000	1918-19—	£
		Section 50, Finance Act, 1916	11,900
		Section 32, Finance Act, 1918	
		(No. 2)	15,000
			26,900
		1919-20—	
		Section 32, Finance Act, 1918 (No. 2) ..	65,000
		Section 32, Finance Act, 1918 (No. 2) ..	70,000
			200,000
		Balance of authority at 31st March ..	300,000
	<u>£500,000</u>		<u>£500,000</u>

The forest revenue credited to the State Forests Account in the fiscal year 1920-21 was greater by £11,184 than in the previous year, and totalled £19,697. This increase, amounting to 132 per cent. over the last year, is largely due to the return of more stable economic conditions, and increased demand for timber for constructional purposes. A more uniform and appropriate system of mature-timber disposal has been evolved, so that the annual revenues will steadily increase and not show that wild erraticity exhibited in the period 1896-1921.

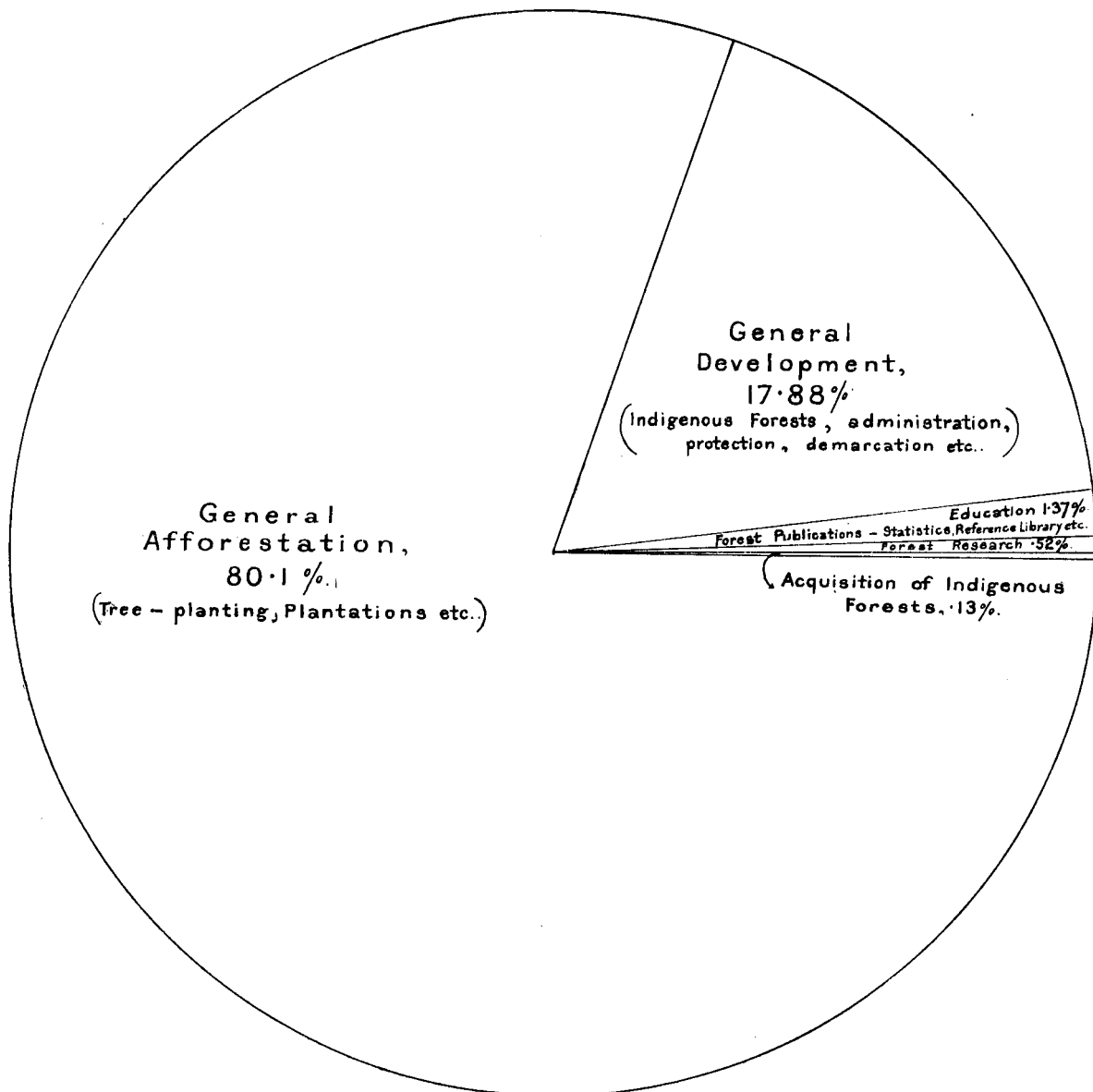
The following table presents a concise summary of the forest receipts from State forests and Crown lands, together with State-forest expenditures. It is evident that while State-forest revenue alone has been insufficient to cover all State-forest expenditure, yet all Crown timber revenues on the average would be more than enough to meet the average outgo:—

New Zealand Forest Finances.

Year.	State Forest Account Revenue.	Crown Land Timber Revenue.	Total.	State Forest Expenditure.
	£		£	£
1896	2,468	2,964	5,432	481
1897	8,504	7,658	14,162	2,472
1898	10,995	8,574	19,569	5,802
1899	5,884	3,392	9,276	3,340
1900	8,845	11,360	20,205	4,002
1901	14,915	10,177	25,092	6,857
1902	17,188	17,045	34,233	10,334
1903	3,870	15,893	19,763	11,017
1904	16,726	13,739	30,465	15,584
1905	12,784	34,820	47,604	18,675
1906	14,385	40,484	54,869	20,188
1907	20,426	30,203	50,629	24,951
1908	18,258	43,551	61,809	25,831
1909	32,619	20,013	52,632	26,962
1910	15,425	15,649	31,074	22,187
1911	14,870	20,176	35,048	23,446
1912	35,193	24,319	59,517	22,810
1913	11,525	19,280	30,805	22,169
1914	11,354	19,424	30,778	28,442
1915	14,732	13,540	27,912	30,318
1916	20,611	20,853	51,446	30,312
1917	12,881	12,817	25,698	27,089
1918	13,299	10,063	23,362	41,851
1919	7,529	8,115	15,644	41,343
1920	8,513	10,345	18,858	66,819
1921	19,697	25,465	45,162	79,551
26 years	373,141	459,909	833,050	612,833
Average per year for period 1896-1921, inclusive	14,350	17,688	32,040	23,570

State Forest Service expenditures on analysis show an increase in debenture interest charge (all afforestation expense), a substantial increase in the salary subdivision due to the appointment of regional Conservators of Forests and Forest Rangers, and a marked increase in general development

—due to survey, demarcation, and reconnaissance of indigenous forests. It will be seen from the following graph that afforestation absorbs about 80 per cent. of the total outgo. This percentage may be expected to steadily decrease as direct afforestation is supplanted by the regrowth in indigenous forest regions.



GRAPHIC EXPOSÉ STATE FOREST SERVICE EXPENDITURES FOR FISCAL YEAR ENDING 31ST MARCH, 1921.

3. MANAGEMENT.

Timber.

The centre of forest exploitation in the North Island is moving centripetally to the heart of the Island. From a national timber-supply standpoint the North Auckland, Taranaki, Hawke's Bay, and southern Wellington regions are now negligible, and the ever-increasing wood needs of the Taranaki, Wairarapa, Hawke's Bay, and other districts will be largely supplied during the next generation from the massif bounded on the west by the Main Trunk Railway, on the north by the Waikato and the thermal-springs country, the east by Lake Taupo, the Urewera country, and the Ahimānawa Range, whilst Taihape will mark the most southern point of this supply area. From this great timber-reservoir, which embraces over 3,000 square miles, head out four of the most important rivers of the North Island—namely, the Waikato, Wanganui, Wangāehu, and Rangitikei. It is vital for the dual need of timber-supply and water-conservation that proper safeguards be herein established against forest-devastation. This, the last great source of timber, should be subjected to a scheme of forest-management whereby it becomes a permanent wood-producing region, and the essential water resources are conserved and stabilized. At the present time the principal forested lands are under the control of interests other than those whose objective is conservation and rational use.

In the South Island there are two forest regions of national importance, and it is to these centres that forest-exploiters are now being attracted. The first and by far the most important is that of the West Coast, where during the past year at least a dozen new mills have been brought into operation.

From this region will the major needs of Wellington, Nelson, Marlborough, and Canterbury be drawn during the years and generations to come. Fortunately for the Dominion, the chief forests of the West Coast have been proclaimed provisional State forests, and are now being subjected to study and examination preliminary to being placed on a sustained-cut basis. The other forest region of national importance in the South Island is situated in Southland, and in three groups—the Catlin's River country (as yet not dedicated as State forest), the country between Sandhill Point and Puysegur Point (which has been dedicated provisional State forest), and Stewart Island.

The aim of the service is to assure the practice of forest-management over these and all Crown forests which are on land chiefly valuable for forestry purposes, and at the same time by rational control of forest-exploitation to secure constant renewal and perpetuation of the resources. The State forests are for use now and are not locked up for future generations. All legitimate demands for standing timber and other forest produce from *bona fide* operators will always be met fairly and squarely by the State Forest Service. (All information as to suitable milling-areas, &c., will be gladly furnished by any officer of the service.)

Grazing.

It is apparent that a widespread use is made of the grazing opportunities offered by State forests throughout the country, for many thousand head of cattle and sheep are fed and sheltered in these areas. During the year an investigation was begun into the economic benefits secured by pastoralists through the exercise of this privilege, and also as to the damage or otherwise done to the forests.

It has been ascertained that little or no control has been exercised heretofore over stock occupation, nor has the revenue received from the use thereof been anything but negligible. It is proposed to continue the study of the effects of grazing, and to draw up a scheme of grazing-management whereby the objects of forest-perpetuation will be successfully attained, and at the same time a reasonable use of the forests for grazing purposes may be secured. It must be emphasized, however, that grazing within State forests must always be subordinate to the main objects of timber-production.

Game and Recreation.

The value of the State forests as production centres for the natural propagation of fur-bearing animals, game, and as recreation playgrounds is just beginning to be appreciated. Plans are being made so that in all timber-sales the natural beauty of the forest scenery is preserved where these timber-sales are situated along highways, bordering rivers, streams, and lakes. Every means will be given to prospective campers, tourists, and travellers to enjoy the recreational resources afforded by the State forests.

The increasing economic importance of the opossum indicates that in the protection of this animal in State forests there is a great potential source of revenue. Efforts are being made to co-operate with the Department of Internal Affairs and the various acclimatization societies in developing the possibilities of breeding and harvesting this valuable fur-bearer. (At least ten thousand opossums were taken in 1921 from State forests.) Game-protection has been made one of the regular activities of the field officers of the service, and in order to assist in this all Forest Rangers have been appointed Rangers under the Animals Protection Act, 1908, and the Fisheries Act, 1908.

Forest-protection.

The effective protection of the national forest estate against its arch enemy, fire, is the keystone of successful forestry. All the carefully made plans of management, regulation, cut, and exploitation count for nought if the growing forest capital is exposed to destruction by fire. This factor in forestry is as important in New Zealand as elsewhere. Just as soon as exploitation begins in the indigenous forests of this country there marches in that archangel of devastation—fire. During the past generation two and a half million acres of virgin timber-land has been destroyed, and in its place is useless barren waste—North Auckland, Thames, the central backbone of the North Island, the Nelson and Marlborough Provinces, and the eastern slopes of the Southern Alps. During this year the orgy of destruction was maintained, and well over 50,000 acres of State woodland went up in smoke.

Your Director is appalled at the apathy and indifference displayed at this wanton decimation; apparently "What is everybody's business is nobody's business." It is absolutely essential that this enormous drain—which may be conservatively estimated to result in a loss of £1,000,000 per year—be checked, and at once. Every individual citizen should concern himself and make his interest felt in the protection of New Zealand forests against fire. The whole question may be summed up in a few words: The residual forests must be saved from destruction by fire by vigilant and continuous control, or in a very few years there will be no merchantable timber forests nor young forests for the generations to come. Fire-prevention is the first step to forest-perpetuation. A general survey of the forest-fire situation was made during the year, and during the immediate danger season a provisional plan of protection will be in operation in the forest districts of high fire hazard—namely, North Auckland, the Wanganui River watershed, and Ruahine Range, through Nelson Province, and along the lower eastern slopes of the Southern Alps.

Other agencies causing forest-damage are deer and stock. A study of these factors is now under way, and within a year a satisfactory plan of control will be evolved.

4. AFFORESTATION AND FOREST-EXTENSION.

The details of State planting are given in the following table :—

Summary of Operations on State Plantations during the Year ended 31st March, 1921.

Forest Plantation.	Number of Trees planted.	New Area planted.	Total Area planted in Trees, 1896-1921.
	No.	Acres.	Acres.
Whakarewarewa	6,170	17	7,983·34
Waiotapu	589,480	333	7,539·65
Kaingaroa West	599,870	502	501·84
Kaingaroa Plains	417,995	210	6,844·28
Puhipuhi	155,664	..	1,200·00
Conical Hills	10,000	..	3,533·50
Pukerau	28,000	..	573·00
Dusky Hill	9,600	..	745·75
Greenvale	426,425	179	1,132·00
Gimmerburn	..	..	88·00
Naseby	181,600	86·25	1,908·75
Hanmer Springs	28,650	..	2,906·50
Balmoral	424,500	54	1,046·00
Totals	2,877,954	1,381·25	38,461·62

Analysis indicates that the acreage of plantations established this year is the lowest since 1903, whilst the number of trees set out was 833,000 less than in the previous year. 2,900,000 trees were set out—36 per cent. for replacement and 64 per cent. to new ground. The large proportion to replacement was necessary owing to the neglect and disorganization of the war and immediate post-war conditions, such as largely increased plant and material costs, and the unsatisfactory conditions in the labour-market during the year. A general reorganization of the afforestation operations was made late in the year, and the programme developed for the incoming year already promises most satisfactory and efficient results.

The year 1920 marks the withdrawal of prison labour from State tree-planting activities. A lasting monument of achievement has been established by the prison tree-planters in the wonderful forest plantations of the Rotorua region and those of the South Island.

Tree-planting by Farmers, and Sales of Trees.

Over 456,000 seedling trees of the quick-growing *Pinus radiata* and eucalypts, and 240 lb. of tree-seeds, were disposed of during the year to farmers and soldier settlers. The call for the hardy, virile tree stock grown in the Forest Service nurseries greatly exceeded the demand, while the total delivery to farmers was greater than that of the previous year by 60 per cent. Many hundred inquiries as to tree-planting problems have been received, and substantial advice and assistance has been given to prospective planters throughout the Dominion. The Dominion Nurserymen's Association has inaugurated an educational tree-planting campaign, and during the year have co-operated very closely with the service by the private supplying and distribution of suitable planting stock for farm wind-breaks, shelter-belts, and wood-lots.

CHAPTER IV.—RESEARCH AND EXPERIENCE.

FOREST ECONOMICS.

Exploitation and distribution of the products of the forest are complementary to the growing and production of timber crops. In other words, the sawmiller is as necessary to the forester as the forester is to the sawmiller. Recognizing this fundamental truth, an early beginning was made last year in a study of the economics of the timber industry "from the tree to the consumer." It is essential that these two interests work very closely together, and it is for that reason that a greatly increased attention will be paid to the developments of the industry. A preliminary study was made of the wood-pulp and paper situation, and the possibility of establishing a paper industry in this country. This study is being carried forward this year. Some assistance was rendered to the Dominion Newspaper Proprietors' Association in exposing to them the probable sources of pulp-wood supply and the available water-powers. When capital becomes more available a further effort will be made to induce the establishment of a pulp and paper manufactory using our indigenous wood-supplies.

Numerous inquiries regarding other specialized uses of various timbers indicate that the local markets show preference for the New Zealand manufactures where available rather than for the imported article. The work of advising on such inquiries is, however, hampered by the lack of information regarding the physical and mechanical properties of practically all the New-Zealand-grown timbers. This state of affairs, coupled with the length of time required to obtain a report on such matters as wood-pulping, stresses the necessity of establishing a forest-products laboratory to conduct such research.



STATE FOREST PLANTATION, WHAKAREWANGA, Rotorua Region.
Pine-plantations overlooking the lake.

Photo Dept. of Agriculture.

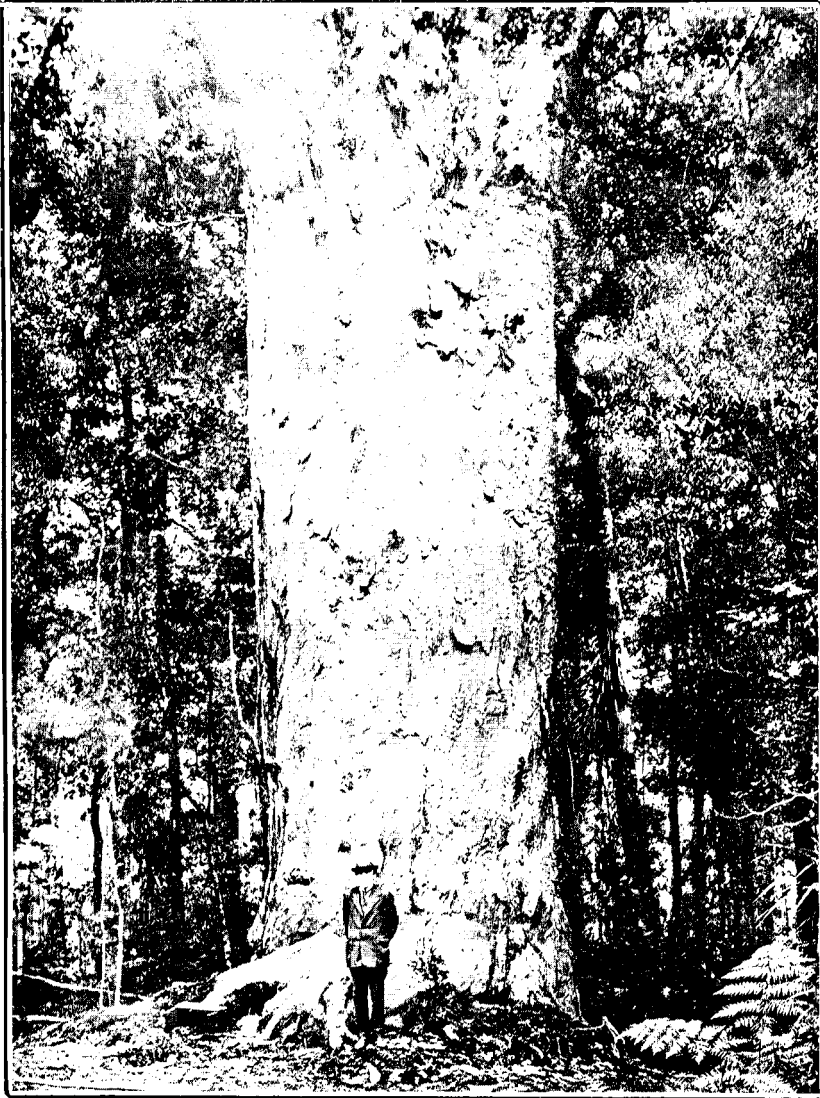


Photo F. H. Wilson.

A GIANT KAURI (57 FT. GIRTH) IN THE NATIONAL KAURI PARK.

(MR. J. THOMAS ON RIGHT TRUNK.)



FARM SHELTER BELTS, CANTERBURY PROVINCE.

[Photo: Dep. of Agriculture]



FOREST FIRE IN THE NELSON REGION.

[Photo: F. W. Winstone]

OVER 50,000 acres of New Zealand commercial and protection forests were destroyed by fire in 1920.

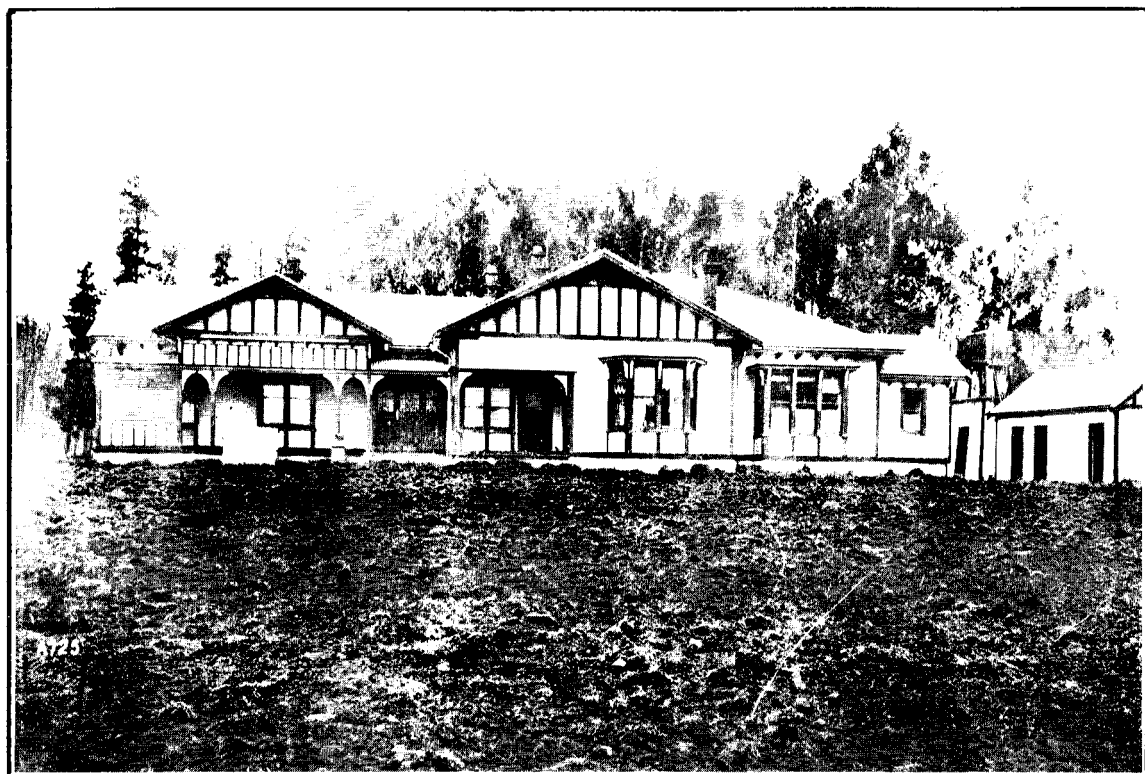


Photo Dept. of Agriculture.
HOMESTEAD IN CANTERBURY BUILT ENTIRELY OF PINUS INSIGNIS.

Samples of New Zealand timbers were forwarded to various forestry organizations in Australia and America, and collections of foreign woods received in exchange.

A sawmillers' reference library has been established in Wellington. It will contain, when complete, series of catalogues covering the requirement of the various wood-using industries, besides plans and layouts of model plants.

FOREST-MANAGEMENT.

Silvical Research.

Progress in the successful application of the principles of forest-management and silviculture is only possible as we have a working knowledge of Nature's *modus operandi* in the growth, regeneration, and life-history of the indigenous forests and trees. Unfortunately, many years of conscientious observation are necessary to establish definite conclusions. With a full appreciation of this necessity, Canterbury College and Auckland University College were approached early last year with a view to securing their co-operation in carrying out extended silvical investigations in our indigenous forests. The response in both cases to this appeal was generous and wholehearted. Mr. Charles E. Foweraker, M.A., M.Sc., F.L.S., of the Biological Department of Canterbury, consented to carry to completion the study of the ecology and regeneration of the taxad rain forest of the Western Botanical District of New Zealand (generally known as the west coast of the South Island). A beginning was made by this gentleman in November, 1920, and studies were carried on through the summer field season. A brief progress report has been made: the complete report will be available in 1924. Provisional conclusions as reached by this investigator indicate that the taxads rimu (*Dacrydium cupressinum*), white-pine or kahikatea (*Podocarpus dacrydiodes*), totara (*Podocarpus totara*), silver-pine (*Dacrydium Colensoi*) do regenerate and reproduce vigorously, and the process of regrowth is in evidence everywhere where fire and stock are excluded.

"The most obvious need" as pointed out by Mr. Foweraker, "is a system of fire-control." He has definitely determined that the outstanding need in the reproduction of the Westland forests shows "fire-prevention is the thing to aim at," and states "Repeated burns and excessive grazing doom regeneration." The service is now taking steps to eliminate these serious enemies to natural regeneration.

Mr. W. R. McGregor, M.Sc., of the Auckland University College, has undertaken to carry through to completion the study of the life-history of the kauri (*Agathis australis*) and the ecology of the northern forests. Mr. McGregor definitely commenced this monumental study in November last, and already his investigations have proven of immense value to the programme of forest-management. This year's investigations have been confined almost entirely to the floristic aspects and to the general survey of the field under observation. Suitable sites for forest meteorological and experimental stations have been selected, and the necessary plant and material has been collected. Mr. McGregor has been able to reach certain practical conclusions of a general nature:—

1. It has been definitely determined that the natural regeneration of kauri (*Agathis australis*), rimu (*Dacrydium laurifolium*), totara (*Podocarpus totara*), matai (*Podocarpus spicatus*), taraire (*Beilschmiedia taraire*), tawa (*Beilschmiedia tawa*), and certain others is dependent on the shade of a natural shelter wood.

2. This shelter wood differs widely in nature, but is usually of two types:—

- (a.) Typical mixed forest, either virgin or cut over by selection fillings. In such situations the conditions essential for regeneration can usually be readily supplied if naturally lacking.

- (b.) Second-growth shelter wood, usually dominated by *Leptospermum* (tea-tree, or manuka).

3. Complete re-establishment of the regenerated stands under natural conditions usually requires a revolution of from twenty-five to fifty years. It follows, therefore, that all care should be taken of residual forest cover remaining after logging. This simply means *fire-prevention*.

4. Timber-felling must be regulated so that the fire danger is minimized, and the itinerant gum-digger must be kept out.

Sample Plots.

In order that financial and economic conditions attendant to the regeneration of our indigenous forests may be accurately determined, areas of growing forests must be demarcated and the trees thereon carefully enumerated and measured from period to period. Several suitable plots were located and demarcated in Westland and plans were made for the definition of similar areas in other forest regions.

Broadcast Seeding.

At Kaingaroa Plains Plantation a profitable experiment was made in the broadcast sowing of *Pinus insignis* seed by mechanical means. The trial sowing this year was made through a grain-drill with disk coulters adapted so that the seed was fed through two spouts only and these about 6 ft. apart. The land received no special preparation beyond the clearing that is usually done for tree-planting. Where the coulters entered the ground properly the germination is satisfactory, and from this it may reasonably be inferred that the method is good and requires only that a specially constructed drill be used in order to be quite satisfactory. The construction of the ordinary grain-drill fits this implement for land that is cultivated and fairly even on the surface. On land such as was used in the trial under discussion the implement was not flexible enough to permit the coulter entering the ground where the surface was uneven, and consequently there were numerous gaps where the seed was simply dropped on the surface of the ground and perished. An area of 4 acres was sown with 4 lb. of *Pinus radiata* seed mixed with 20 lb. of oats. The time occupied in doing the work was three hours with one man and three horses. From the trial made it is estimated that such work would cost from £1 to £2 per acre, the price varying according to the amount of preliminary clearing necessary before sowing the seeds.

CHAPTER V.—GENERAL.

REPORT OF THE TIMBER TRADE FOR THE FISCAL YEAR ENDING 31ST MARCH, 1921.

Production.

A statement showing the actual output in superficial feet of the various kinds of timbers from New Zealand sawmills during the years ending 31st March, 1919, 1920, and 1921, has been compiled from figures supplied by the Board of Trade and the Railway and Public Works Departments.

PRODUCTION OF SAWN TIMBER.

Item.	1919.		1920.		1921.	
	Sup. ft.	%	Sup. ft.	%	Sup. ft.	%
Kauri (<i>Agathis australis</i>)	21,835,023	9.58	22,598,391	7.63	19,698,184	6.37
Rimu (<i>Dacrydium cupressinum</i>)	111,318,579	48.86	145,584,203	49.16	152,182,339	49.23
White-pine (<i>Podocarpus dacrydioides</i>).. ..	63,136,665	27.74	82,419,821	27.82	79,612,233	25.75
Totara (<i>Podocarpus totara</i>)	13,387,038	5.87	14,414,298	4.86	17,810,668	5.76
Matai (<i>Podocarpus spicata</i>)	11,930,040	5.23	17,820,597	6.02	22,776,834	7.37
Beech (<i>Fagus fusca</i> , <i>F. Solandri</i> , and <i>F. Menziesii</i>)	4,466,116	1.96	9,650,344	3.25	7,707,651	2.49
<i>Pinus insignis</i>	1,501,274	0.66	3,064,201	1.05	6,844,868	2.21
Other	228,377	0.10	613,225	0.21	2,529,665	0.82
Totals	227,803,112	100.00	296,165,080	100.00	309,162,442	100.00

The output for the year ending 31st March, 1921, is only 4.38 per cent. above that for 1920, compared with the increase experienced from 1919 to 1920 of 30 per cent. During the first three quarters of the year—from April to December, 1920—the production was heavy, but the January–March, 1921, period showed a marked decrease.

The unprecedented demand for timber which gradually arose during the latter part of the war period called into being fifty new sawmills. The output from these was only just beginning to reach the market towards the latter part of the year under review, at which time, unfortunately, the first effects of the present financial stringency were beginning to be felt in a marked decline in demand.

A serious shortage in all classes of labour was experienced throughout the year—more particularly skilled labour. To meet the high cost of living a substantial increase in wages was granted, this being reflected to some extent in the higher cost of production and the increased prices of timber sanctioned by the Board of Trade.

Import.

A general revival of the building industry and the renewal of many constructional activities temporarily suspended during the war is responsible for the heavy increase in the importation of all classes of timber. The apparent shortage of timber-supplies during the mid-year period accounted in a large measure for excessive importations of Oregon pine, and the bulk of these importations arrived during the last quarter of the year and added very considerably to the slackening in demand for local timber.

Prices in every case have advanced, the most noticeable being that of jarrah, which, based on figures obtained from the Comptroller of Customs, shows an increase of 9s. per 100 sup. ft. over the figure for the year ending 31st March, 1920.

Export.

Much the same conditions as affected the timber trade within New Zealand governed the export trade. We find on examination of the export statistics a reflection of these conditions, for the volume of shipments rose during the first nine months and showed a marked decline in the last quarter. Taking the year as a whole, however, the export trade can be considered to have been exceptionally good, and a survey of the statistics relating thereto may be of interest. The quantity allowed to be exported has, of course, been under strict control, and totalled for the year ending 31st March, 1921, 62,611,402 sup. ft.

While exceeding the figure for the previous year, it is noticeable that this is almost entirely due to the heavy shipments of white-pine to Australia. Rimu shows a slight increase, and kauri a large decrease, over the figures for the year ending March, 1920. The average export price for all timbers per 100 sup. ft. f.o.b. exporting ports, was 21s. 7d., compared with 18s. and 16s. 2d. for the years ending 31st March, 1920 and 1919, respectively. (These figures are based on information furnished by the Comptroller of Customs.)

Markets and Prices.

The demand for timber during the year was not reflected in prices, as would ordinarily be the case under usual trade conditions, for during the whole period the prices have been subject to control by the Board of Trade, so that a review of prices in relation to the year's trade conditions is not called for. This, of course, refers only to trade within New Zealand, for it is quite well known that the prices secured for timber exported to Australia during the greater part of the year were considerably higher than those permitted to be charged locally.

There was an increased demand for minor timbers, such as tawa (*Beilschmiedia tawa*), tanekaha (*Phyllocladus trichomanoides*), taraire (*Beilschmiedia taraire*), rewarewa (*Knightia excelsa*), mangeao (*Litsea calicaris*), pukatea (*Laurelia novae-zealandiae*), rata (*Metrosideros robusta*), and *Pinus insignis*.

Various factors contributed to the increased prices sanctioned by the Board of Trade during the year. Mention has already been made of the trend of labour conditions; rail charges have increased (Auckland, 1s. per 100 sup. ft., and Greymouth-Hokitika, 6d.); and in addition an advance of 1s. per 100 sup. ft. was allowed for dressing, provided that it did not raise the average cost above 4s. per 100 sup. ft.

Following are the other increases (per 100 sup. ft.) :—

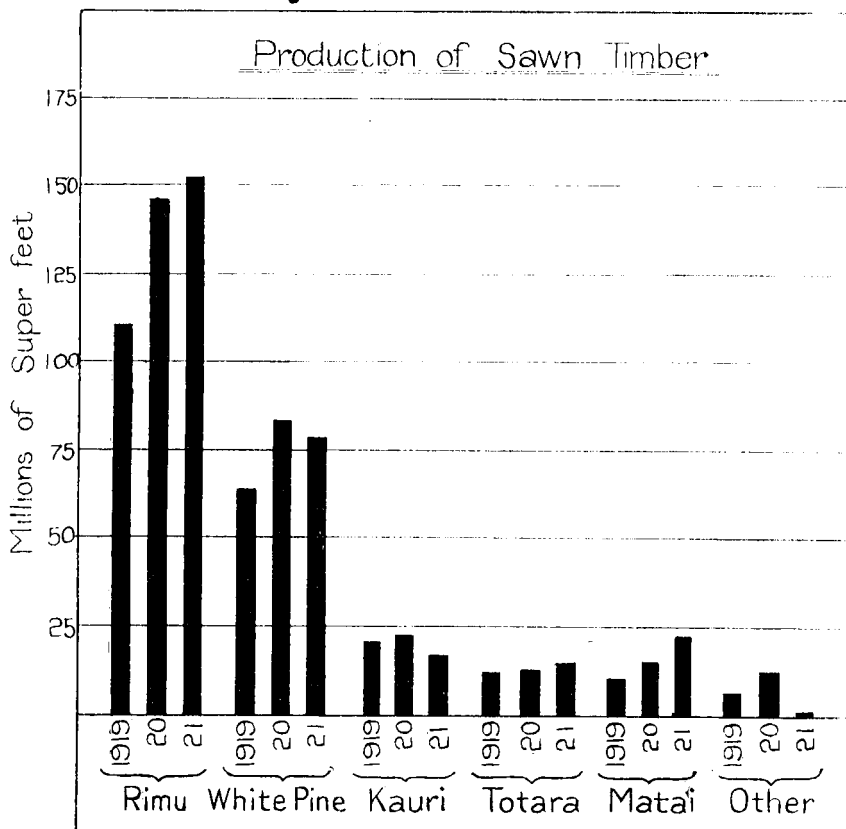
Rimu, Matai, and Totara :—

District.	Heart.		Ordinary-building Class.	
	s.	d.	s.	d.
Auckland	5	0	4	0
Waikato	2	6	2	0
Rangitikei	2	6	2	0
Greymouth-Hokitika	1	6	1	6
Southland-Otago	1	6	1	6

Kauri: First class and heart, 4s. 6d.; medium and second class, 4s. In January, 1921, a new class of kauri, known as "clean heart," was approved at a price of 10s. extra on first-class prices.

Trade Extension.

The specialized uses of many of the minor timbers are now becoming more generally known. Already an increased demand is noticeable as a result of the Forest Service's educational work amongst the wood-using industries. Particular attention has been paid to the value of our native timbers in the manufacture of carriage-parts, tool-handles, &c., and such encouragement met with that the work will be carried on in a more extensive manner this coming year. The manufacture of such articles as laths, shingles, clothes-pegs, tool-handles, &c., which at present are imported into the Dominion, offers good opportunities for the establishment of new industries.



SIR DAVID HUTCHINS.

This great master of silviculture and forestry in general passed away during the year in Wellington after a brief illness. His life was full of achievement, and he has left behind him a monument which will stand for all time. This memorial is not built of stone, but of something more lasting and useful in the record of achievements and knowledge of nature which has contributed to man's progress and the betterment of civilization. Sir David deserved well of humanity.

BRITISH EMPIRE FORESTRY CONFERENCE.

At the instigation of the chairman (Lord Lovat) and the members of the British Forest Commission a very important assembly of administrative forest officers and others from every part of the British Empire was held in London during July, 1920. New Zealand was represented by Sir Thomas Mackenzie, G.C.M.G., High Commissioner of New Zealand. The chief object of the conference was to

permit of an exchange of views on national and Imperial forest-policy methods of conservation and exploitation, and to compile a preliminary inventory of the timber resources of the Empire. Several resolutions were passed of peculiar value to New Zealand. The following are condensed *résumés* :—

- (1.) Each Government of the Empire should lay down a definite forest policy to be administered by a properly constituted and adequate Forest Service.
- (2.) A stable forest policy requires the collection, co-ordination, and dissemination of facts as to the existing state of the forests and the current and prospective demands on them.
- (3.) It should be the primary duty of forest authorities to establish systematic schemes of forestry education.
- (4.) The proper development of the forestry resources of the Empire requires the establishment of an Imperial Forest Bureau, whose purpose will be to advise on the development of the Empire's forest resources, act as a clearing-house for all services and ideas, assist in the purchase of seed-supplies, and in research, education, and policy.

The next conference is to be held in Canada in 1923.

THE FOREST ATLAS.

During the year a central depository for the original maps, plans, State-forest records, &c., was established at Wellington. This central depository is known as the Forest Atlas, and in it are deposited all field surveys, forest inventories, and statistical data. It is the basis for the working forest maps incident to forest-management. This work is being co-ordinated with that of the regional offices, so that accuracy is assured for the sound formation of the definitive forest working-plans. A complete system of "mother" maps on a scale of 1 in. to 1·5 miles is under course of compilation for the whole of the Dominion's forests. This activity is well in hand, and will be completed within six months. A general series of maps of all State forests is being gradually built up as the field-work and finances permit. The Forest Atlas is also the depository for all original photographic records essential in the recording of forest stands, types, conditions, and other factors of silvical operations. These permanent records will be available to the public on request.

FOREST SERVICE LIBRARY.

The formation of a compact but comprehensive working library for reference purposes was begun during the year. It is proposed to add to this library as funds permit, as well as to extend it to the regional offices. The public will be invited to make use of its facilities just as soon as space can be secured for its proper housing. Books and pamphlets to the number of 200 were installed during the year.

An up-to-date catalogue reference library of manufactories producing and offering equipment and material used in commercial forest-exploitation was also opened. It is considered that this section of the library will be of use to sawmillers and the woodworking industry generally.

RESIGNATION OF CONSERVATORS OF STATE FORESTS.

On the appointment of the Forest Service Conservators of Forests at Auckland, Rotorua, Hokitika, Tapanui, and Invercargill, the Commissioners of Crown Lands holding office of Conservators of State Forests at Auckland, Hokitika, Christchurch, Dunedin, and Invercargill resigned their appointments. The Service wishes to express its grateful appreciation of the interest, attention, and sympathy that forestry has received from these gentlemen during their tenure of office.

CHAPTER VI.—RECOMMENDATIONS.

1. STATE FORESTS.

It is obvious that the problem of assuring the present and future timber-supplies of this Dominion must be solved through the conservation and re-establishment of forests in the indigenous-forest regions, and not chiefly by the artificial formation of exotic-tree plantations.

You are therefore recommended, sir, to secure the dedication of every available acre of Crown forest land as provisional State forest. Reasoned and conscious forest control will assure the fullest utilization of the residual virgin supplies, and permit of a competent classification of the land as to whether it is chiefly valuable for settlement or for forestry. It is recognized that forests were made for men and not men for forests, and the co-ordination, therefore, necessary between the settlers' (farmers') interests and those of the millers and other users of forest products will be carefully balanced. The Forest Service is very much alive to the call for more land for settlement—hence all forested lands chiefly valuable for agriculture will be milled first (other things being equal) and handed over to the Lands Department. There are several hundred thousand acres of Crown forest still unsubjected to competent forest administration. These areas of undedicated and unalienated Crown forests, carrying many hundred millions of feet, are situated in the North Auckland, Manukau plateau, King-country, Taranaki, the Urewera district, the ranges from Lake Taupo to Wellington, along the eastern slope of the Southern Alps, from the Wairau River headwaters southwards to Southland, the Catlin's River country in Otago, and in certain parts of Nelson and Westland Provinces.

2. UNITY OF ADMINISTRATION.

Success in securing efficient and economical results from the application of forestry to your State forests can only be attained by unity of control. There must be only one authority managing State

forests. At present there are several. You are recommended to secure the functioning of one authority, and one only, and that is the State Forest Service, which is the one instrument equipped to deal with forestry.

3. THE FOREST ACT.

Continuity of policy is vital to the practice of forestry, and you are therefore recommended, sir, to secure the expression of your forest policy in a Forest Act, thereby crystallizing a definite programme of State-forestry action at least for a working-period of five to ten years.

4. SCHOOL OF FORESTRY.

Your forest policy and programme will only make such progress as is possible by the operations of trained forest technicians. One year has now been lost in providing educational facilities. You are advised, sir, to establish the School of Forestry without delay.

5. APPOINTMENTS.

Two of the most important forest-conservation regions—namely, the Wellington Region, which embraces Hawke's Bay, Wellington, and Taranaki Provinces; and the Nelson-Marlborough Region, which includes these two provinces—are still without Conservators of Forests. The forest research and experimental programme is being sadly hampered through the lack of a trained forest investigator. You are advised, sir, to fill these three posts at the earliest possible opportunity, in order that our constructive programme may be kept in line with our administrative activities.

6. FOREST FIRES.

You are advised, sir, that the greatest enemy to successful forest-management in New Zealand is fire. Until and unless this arch-enemy can be controlled no forest plans are worth the paper they are written on. You are recommended, sir, to provide full and adequate powers in the Forest Act for the use of the Forest Service in dealing with this serious and grave danger to New Zealand's forest heritage.

L. MACINTOSH ELLIS,
Director of Forestry.

ANNEXURES.

ANNEXURE No. I.—STATE AND PROVISIONAL STATE FORESTS AS AT 31st MARCH, 1921.

Land District.	Area in Acres at End of Fiscal Year, 1920.		Changes in Acres during the Fiscal Year, 1920–21. Net Increase in Area.		Area in Acres at End of Fiscal Year, 1921.		Percentage of Area of Land District in State and Provisional State Forests.
	State Forests.	Provisional State Forests.	State Forests.	Provisional State Forests.	State Forests.	Provisional State Forests.	
North Auckland ..	106,039	Nil	911	14,898	106,956	14,898	2·7
Auckland ..	144,796	24,255	..	565,305	144,796	589,560	8·1
Hawke's Bay ..	199,653	15,350	..	Nil	199,653	15,350	3·9
Taranaki ..	69,564	35,264	..	815	69,564	36,079	4·3
Wellington ..	500,506	Nil	..	Nil	500,506	Nil	7·3
Nelson ..	19,955	1,288,221	..	682,847	19,955	1,971,068	42·2
Marlborough ..	79,753	105,631	..	Nil	79,753	105,631	6·7
Westland ..	442	1,126,944	1,100	500,059	1,542	1,627,961	42·1
Canterbury ..	290,176	Nil	..	Nil	290,176	Nil	3·0
Otago ..	129,465	231,379	..	21,643	129,465	253,022	4·2
Southland ..	125,953	466,328	..	54,754	125,953	521,082	8·2
Totals ..	1,666,302	3,293,372	2,011	1,840,321	1,668,319	5,134,651	

State forests and provisional State forests comprise 10·3 per cent. of the total area of the Dominion. Total area of State forests and provisional State forests at 31st March, 1921, 6,802,970 acres.

ANNEXURE No. II.—REPORT UPON FORESTATION OPERATIONS IN THE NORTH ISLAND.

(H. A. GOUDIE, Conservator of Forests, Rotorua Conservation Region.)

LABOUR.

Whilst there has been a fair amount of casual labour available during the year it has not always been possible to pick and choose, and on the whole it has been difficult to get men that were altogether suitable for the work. For three months prior to the withdrawal of the prison labour in July the

number of prisoners employed gradually decreased, with the result that the progress made with the work was most unsatisfactory. In order to make up leeway it was necessary to get together a gang of about thirty workmen to replace the prison labour, and as this took some considerable time to accomplish the work in consequence was not finished until late in the season.

The value of work done by prison labour hereunder summarized completes the record of same from 1901 up to the withdrawal of this labour from forestry work :—

Summary of Prison Labour.

Station.	Year.	Period.	Total Value of Work performed.			Average Daily Number of Men employed during Period.	Average Value of Work per Man per Year.		
		Years.	£	s.	d.		£	s.	d.
Whakarewarewa Plantation ..	1904-17	12-58	12,518	7	10	12-86	77	7	7
Waiotapu Plantation ..	1900-13	12-08	24,655	2	6	30-22	67	11	3
Kaingaroa Plains Plantation ..	1920-21	0-42	378	4	3	9-10	41	11	3
„	1912-21	7-60	15,495	10	4	22-76	89	11	8

Prison labour on afforestation work ceased on the 22nd July, 1920.

TREE-GROWING.

The weather conditions during the spring and early summer were ideal, and resulted, with a few exceptions, in good growth being made by the nursery stock. This period of favourable weather was, however, followed by a protracted spell of dry, hot weather which arrested the growth of most of the seed-bed stock, with the result that these are somewhat below the average in size. The lined-out trees are, as a whole, a splendid lot, the good start obtained in the spring being responsible for the strong, well-rooted condition of the stock. The percentage of trees raised from seed during the year was marred by the exceptionally poor germination obtained with the seed of Douglas fir, which from 100 lb. produced only 300,000 trees, or one-fifth of the number raised from a similar quantity of seed the previous year.

Some 350,000 trees were raised especially for selling to private planters, the principal species being *Pinus radiata*, *Cupressus Lawsoniana*, *Cupressus macrocarpa*, and thirteen species of the genus *Eucalyptus*. All are good except the eucalypts, which as a whole are somewhat under size.

During the spring 1,500,000 seedlings were lined out in the temporary nursery at Kaingaroa, and, in spite of the fact that the work was not completed until the first week in October, the growth made is most satisfactory and the death-rate practically nil. Owing to the difference in the soil and climatic conditions, the growth made by nursery stock at Kaingaroa is not nearly so vigorous as in the nursery at Rotorua. The stock, however, is much sturdier, and this is especially true of the two-year-old plants of *Pinus radiata*, which under warmer conditions generally become overgrown and less suitable for transplanting.

EXTENSION OF PLANTATIONS.

An area of 1,062 acres was planted during the year, thus bringing the total area planted to date in the North Island plantations to 26,068 acres. With the exception of 17 acres planted at Whakarewarewa which was of an experimental nature, the whole of the extension work was done on the Kaingaroa Plains. The results as a whole are satisfactory, although, owing to the dry summer and autumn, the growth made is below the average.

FIRE PROTECTION.

No fires occurred in the plantations during the year. The dry weather experienced during the last quarter of the year, however, caused considerable anxiety on account of the prevalence of fires in the surrounding country. The only safe course is to definitely locate the position of every fire when once smoke is observed, and treat every sign of fire as a possible danger to the plantations. The anxiety which usually exists until a fire is located will be largely avoided when the lookout stations are established. The sites chosen for these stations command a view over a very large area of the plantations, and, what is equally important, over a great deal of territory outside the plantation boundaries. At Whakarewarewa Plantation the site chosen is the top of Mount Kakapiko, a position from which seven miles of the boundary on the Rotorua-Waiotapu Road as well as three parts of the plantation can be kept under observation. The planted areas at Waiotapu and Kaingaroa will be well provided for with the lookout station which it is proposed to erect on the summit of Maungakakamea. From this place a magnificent view can be obtained over a huge area of country; the entire area of Waiotapu Plantation and practically every yard of the boundary can be seen, while three-fourths of the planted area on the Kaingaroa Plains can be observed. The large area of unoccupied country, clothed chiefly with a strong growth of bracken, manuka, and other shrubby plants, lying adjacent to the plantation areas, necessitates constant labour being spent on the fire-breaks. Inside the boundaries a narrow strip is ploughed where possible and the weed-growth kept in check by harrowing, while a further measure of safety is secured by burning off wide strips outside the boundaries. The ploughing and harrowing of firebreaks has been more economically and expeditiously performed since the tractor was purchased for this work. Ninety per cent. of the fire-breaks at Kaingaroa and Waireka,

as well as a considerable portion of the fire-breaks at Waiotapu, have been kept in an efficient state entirely by the use of the tractor. Two five-horse teams would have been required to perform the same amount of work, with the added disadvantage that feed and water would have had to be carted to the teams.

A further aid to the prompt suppression of fires will be provided during the coming year, when it is proposed to establish depots for keeping fire-fighting tools at convenient places throughout the entire area under trees. In all, the erection of eighteen such depots is contemplated. The increasing interest taken by many citizens, both European and Maori, in the fire-prevention work is most gratifying, and is herein gratefully acknowledged. Landowners adjacent to the plantation areas have willingly co-operated with the Forest Rangers both by notifying them of their intention to burn off and by permitting and assisting with the burning of strips along the plantation boundaries. Telephonic warnings have been frequently received from persons who have observed fires in the vicinity of the plantations, whilst others, of their own volition, have extinguished fires which might have spread and caused destruction.

The spread of fire is due in a great measure to the large area of unoccupied land in the Rotorua Region. Fires are started by settlers for the purpose of burning off their holdings, and thoughtlessly allowed to spread into adjoining country; and occasionally along tourist routes a fire is started by the throwing of a lighted match or cigarette from a vehicle. The fire danger will probably always exist to some extent, but it could and should be lessened by the introduction of legislation that would act as a deterrent to thoughtless or vicious persons.

BUILDINGS.

The building done during the year was carried out under very great difficulties. Materials were difficult to procure and, like tradesmen's wages, were high in cost. Considerable delay occurred in the delivery of the timber, and this was responsible for increasing the labour-cost to some extent. Additions were made to the two houses in the nursery, and to the building at the Green Lake, which was converted into a suitable dwelling for the forest guard. The erection of the cottages for workmen was unfortunately not able to be undertaken, as the material for this was not delivered until close on the end of the fiscal year. The workmen's cottages will be started early in the coming year, and it is expected that the twelve buildings provided for will be completed by the spring.

EXPERIMENTAL WORK.

A trial which was made with the direct sowing *in situ* of seed of *Pinus radiata* at Kaingaroa gave sufficiently encouraging results to show that, if the method adopted was developed, there is reasonable grounds for believing that much of this land could be successfully afforested at a comparatively low cost. Some years ago trials were made (1) of sowing broadcast the seed amongst the natural vegetation, and (2) of sowing a pinch of seed in a prepared spot. The first method failed, while the second one was only partially successful. From these trials it was apparent that the failures were due chiefly to the lack of moisture available for the seedling during the early stages of its existence. With the sowing in prepared spots the chief fault lay in the fact that failures frequently occurred in patches, and, as the spots were evenly spaced, there were undesirable gaps left.

PRIVATE PLANTING AND SALE OF TREES.

There was a marked increase in the number of applications for trees and tree-seeds during the year, the quantities disposed of being 343,025 trees and 220 lb. of tree-seeds, as against 185,890 trees and 130 lb. of tree-seeds for the previous year. As usual, the demand was chiefly for the fast-growing and hardy species of eucalypts and *Pinus radiata*, and in most cases the trees were planted in single rows along the boundaries for providing shelter for stock.

The correspondence which is entailed with this branch of the service's activities is always very heavy during the planting season, and, although the results are not at present very apparent, the efforts made to encourage and direct the planting done by private individuals must have a beneficial result upon the country in the long-run. These efforts are gradually being directed upon a wider sphere. The co-operation of private nursery firms in growing and selling at reasonable rates approved kinds of forest-trees was secured through the executive of the Nurserymen's Association when in conference last December. Provincial and district secretaries of the Farmer's Union are being circularized, and arrangements are in progress for detailing an officer to visit all parts of the North Island and meet and advise intending planters. In this way it is hoped to stimulate an interest in tree-growing and induce every land-owner to devote at least a portion of his land to the growing of a timber crop, and to plant those trees which have an economic value quite apart from their use as shelter.

REVENUE.

The amount of revenue derived from the North Island plantations and nursery is detailed hereunder along with last year's revenue for comparison :—

	1920-21.			1919-20.		
	£	s.	d.	£	s.	d.
Sales of trees (343,025)	677	3	8	339	9	3
Sales of tree-seed (220 lb.)	153	6	7	114	17	11
Sales of firewood (92 cords)	194	11	6	331	11	0
Sales of posts and battens (1,400)	3	10	0	210	15	0
Grazing	112	5	11	144	8	9
Rent of cottages	289	11	8	..	..	..
Sundry recoveries	181	12	6	209	10	11
	£1,612 1 10			£1,350 12 10		

PREPARATIONS FOR 1921 PLANTING.

Preparations for planting at Kaingaroa Plains and at Kaingaroa West are well in hand. The approximate percentage of each species it is proposed to plant is as follows: Douglas fir, 52·5 per cent.; *Pinus ponderosa*, 20 per cent.; *Pinus radiata*, 23·4 per cent.; *Pinus strobus*, 0·8 per cent.; *Pinus Laricio*, 3·3 per cent.

ANNEXURE No. III.—A REPORT UPON AFFORESTATION OPERATIONS IN THE SOUTH ISLAND.

(D. J. BUCHANAN, Conservator of Forests, Canterbury-Otago Conservation Region.)

During the year an area of 319½ acres was planted, thus increasing the total area planted in the South Island to 12,392½ acres. That the new area planted is so small is accounted for by the fact that practically half of the total number of trees transferred to the plantations was utilized in replacing failures over several seasons' planting-areas, this phase of operations having, as a result of the shortage of labour and an inadequate supply of the required species, been necessarily somewhat neglected for a considerable period.

Trees raised in the nurseries during the year are estimated at 3,616,700, while the total raised to date is 48,521,796. Tree-raising was carried out under somewhat unfavourable conditions, the spring season being generally very late, while in the summer each district experienced more or less protracted periods of drought, which had an adverse effect upon the growth of nursery stock. The total number of trees in the nurseries on the 31st March was 6,110,900, and the output for the coming season is estimated at approximately 1,600,000.

The results obtained on the plantations are generally good, the percentage of failures amongst recently planted trees being considerably lower than that of the previous year.

LABOUR.

Labour has been plentiful throughout the year, and it has been possible to undertake much work that had of late years been neglected, and to expedite preparations for the approaching season. It is satisfactory to note that the class of labour available has shown marked improvement over that of the previous year, the somewhat shiftless workman who accepted employment and quickly became dissatisfied having been gradually replaced by a much steadier and more efficient type. Preference in filling vacancies has again been given to returned soldiers, many of whom have proved worthy of consideration and evinced a desire to take forestry work as a permanent occupation.

SALE OF TREES TO FARMERS.

Trees to the number of 113,115 and tree-seeds aggregating 20½ lb. in weight were supplied to farmers and local bodies during the year. Full advantage of the opportunity to obtain trees free of charge was taken by soldier settlers, who secured approximately one-third of the total number distributed. Owing to the shortage in *Pinus radiata* and *Cupressus macrocarpa*—species for which a heavy demand was experienced—100 applications for some 80,000 trees had to be refused. Approximately 250,000 trees have been reserved for the requirements of farmers and local bodies during the coming winter, and, as numerous applications are now being received, it is anticipated that this number will be fully booked.

GRAZING OF SHEEP ON PLANTATIONS.

Sheep have again been grazed on some of the older plantations with good results, the expenditure in connection with the upkeep of fire-breaks having by this means been reduced to a minimum. At Hanmer Springs a neighbouring runholder was granted a lease, for a limited number of sheep, of the older part of the plantation, while at Conical Hills the grazing was done, as formerly, with a departmental flock.

REVENUE.

The amount of revenue derived from the South Island plantations and nurseries during the year was £1,435 8s., details of which are given hereunder. The increase of £331 18s. over the previous year's revenue was derived chiefly from house-rentals. A slight increase in the sale of trees and firewood will be noted, while a corresponding falling-off occurred in the revenue for wool and sheep.

	£	s.	d.
Trees (113,115)	273	15	9
Sheep	457	4	3
Wool and skins	59	15	1
Firewood, poles, &c.	243	14	5
Grazing	29	19	6
House-rentals	363	4	0
Sundry recoveries	7	15	0
Total	£1,435	8	0

SURVEY WORK.

A survey party has recently been working on the Greenvale Plantation reserve, dividing the remaining area of about 4,000 acres into blocks and laying off the necessary roads and fire-breaks. The country does not lend itself to subdivision into areas of uniform size, and efforts have been directed chiefly to carrying out the work in a manner that will allow the most economical and efficient fire-protection methods to be adopted.

On completion of the work at Greenvale the party will be transferred to Pukerau Plantation, which, although planted up for several years, has not yet been surveyed.

ACQUIREMENT OF NEW AREAS.

At Hanmer Springs an area of 15 acres was purchased for nursery purposes, and is now being prepared for tree-raising next season. The old area was not of sufficient size to permit a large output to be maintained indefinitely without seriously reducing its productivity, and it is anticipated that with the additional area now available much better results will be obtained. An area of 306 acres adjoining the Naseby Plantation was also acquired. This section will be used chiefly for the production of fodder crops, and on it the Forest Ranger's residence is now being erected.

GENERAL.

The preparation of areas at Balmoral, Naseby, and Greenvale Plantations, aggregating over 900 acres, for planting during the coming season has been practically completed.

During the winter months a capable officer will tour the South Island conducting a series of addresses on forestry, and giving assistance generally in the way of inspections of land and advice on tree-planting to local bodies and private individuals.

I desire here to record my appreciation of the willing and able assistance received by me from all officers during the year.

ANNEXURE No. IV.—SUMMARIES.

SUMMARY SHOWING THE AREA PLANTED IN TREES (IN ACRES).

North Island Plantations.

Plantation.	Pines.	Larch.	Eucalypti.	Spruce and Douglas Fir.	Douglas Fir.	Miscellaneous.	Totals.
Whakarewarewa	3,154·490	2,557·800	1,468·700	643·310	..	159·040	7,983·340
Waiotapu	6,033·850	3,310·850	180·500	..	..	14·450	9,539·650
Kaingaroa West	501·844	..	..	..	..	..	501·844
Kaingaroa Plains	6,359·414	..	..	..	447·576	37·296	6,844·286
Puhipuhi	300·000	..	900·000	..	..	..	1,200·000
Total	16,349·598	5,868·650	2,549·200	643·310	447·576	210·786	26,069·120

Main South Island Plantations.

Plantation.	Pines.	Larch.	Spruce and Douglas Fir.	Ash and Birch.	Ash and Poplar.	Miscellaneous.	Totals.
Conical Hills	1,850·00	913·00	138·50	..	126·00	506·00	3,533·50
Pukerau	555·00	..	..	..	..	18·00	573·00
Dusky Hill	270·75	234·25	93·25	46·75	..	100·75	745·75
Greenvale	1,091·50	..	..	..	..	40·50	1,132·00
Gimmerburn	74·00	..	..	..	..	14·00	88·00
Naseby	1,605·50	271·00	..	..	..	32·50	1,909·00
Hanmer Springs	1,409·00	1,177·00	..	..	..	320·50	2,906·50
Balmoral	1,042·50	..	..	..	..	3·50	1,046·00
Totals	7,898·25	2,595·25	231·75	46·75	126·00	1,035·75	11,933·75

SUMMARY OF OPERATIONS IN NURSERIES DURING THE YEAR ENDED 31ST MARCH, 1921.

Name of Nursery.	Total Expenditure.				Trees in Nurseries.			
	Tree-growing.	Maintenance.	Buildings, &c.	Total.	Estimated Trees raised during Year.	Output of Trees.		Estimated Number in Nurseries at 31st March, 1921.
						Trees sent to Plantations during Year.	Trees sent to Outside Places during Year.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.				
Rotorua ..	8,456 12 0	443 10 6	1,438 1 2	10,338 3 8	1,735,000	1,769,179	407,447	11,000,000
Tapanui ..	1,839 14 1	2,612 9 10	808 5 3	5,260 9 2	1,155,000	474,025	66,250	2,262,700
Ranfurly ..	831 3 9	124 2 7	507 0 10	2,472 7 2	450,700	181,600	4,230	1,004,820
Hanmer Springs..	1,956 14 0	1,338 2 0	748 13 0	4,443 9 0	2,011,000	453,150	42,774	2,843,400
Totals ..	13,084 3 10	5,518 4 11	3,512 0 3	22,114 9 0	5,351,700	2,877,954	520,702	17,110,920

SUMMARY OF OPERATIONS IN NURSERIES FROM 1896 TO 1921.

Name of Nursery.	Total Expenditure.				Estimated Number of Trees raised.	Output of Trees.	
	Tree-growing.	Maintenance.	Buildings, &c.	Total.		To Plantations.	To Outside Places.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.			
Rotorua ..	70,850 3 3	8,065 18 9	13,627 14 4	92,543 16 4	75,126,218	61,715,686	2,410,532
Tapanui ..	33,351 7 2	6,763 14 1	6,612 9 4	46,727 10 7	20,979,968	16,490,118	1,405,355
Ranfurly ..	17,810 18 10	2,694 15 5	4,400 5 5	24,905 19 8	7,664,947	6,071,168	408,459
Hanmer Springs ..	18,987 1 1	3,407 7 6	4,455 8 11	26,849 17 6	16,644,811	11,799,905	670,954
Scarborough* ..	6,399 9 10	..	2,856 17 3	9,256 7 1	3,059,610	1,965,095	1,094,515
Kurow* ..	960 4 2	..	2,109 18 5	3,070 2 7	172,460	..	172,460
Totals ..	148,359 4 4	20,931 15 9	34,062 13 8	203,353 13 9	123,648,014	98,041,972	6,162,275

* Nursery now closed.

N.B.—Expenditure has not been allocated to “Maintenance” separately until 1917–18.

SUMMARY OF OPERATIONS IN PLANTATIONS DURING YEAR ENDED 31ST MARCH, 1921.

Name of Plantation.	Trees.			Total Expenditure for Year, including Cost of Trees from Nurseries.	New Area planted.
	Number received from Nursery.	Number used to replace Losses.	Number planted on New Area.		
				£ s. d.	Acres.
Whakarewarewa ..	6,170	2,270	3,900	6,191 12 8	17
Waiotapu ..	589,480	176,400	413,080	8,274 5 4	333
Kaingaroa West ..	599,870	..	599,870	4,355 12 10	502
Kaingaroa Plains ..	417,995	142,285	275,710	8,861 5 8	210
Puhipuhi ..	155,664	155,664	..	2,241 6 7	*
Conical Hills ..	10,000	10,000	..	2,525 11 11	..
Pukerau ..	28,000	28,000	..	1,252 3 5	..
Dusky Hill ..	9,600	9,600	..	585 3 3	..
Greenvale ..	426,425	113,825	312,600	10,034 8 6	179
Gimmerburn ..	..	..	..	32 14 7	..
Naseby ..	181,600	31,050	150,550	4,113 15 8	86½
Hanmer Springs ..	28,650	28,650	..	2,287 15 8	..
Balmoral ..	424,500	333,500	91,000	5,933 5 9	54
Waitahuna ..	..	..	..	8 5 8	..
Total ..	2,877,954	1,031,244	1,846,710	56,699 7 6	1,381½

* Approximately 150 acres replanted.

SUMMARY OF OPERATIONS IN PLANTATIONS FROM 1896 TO 1921.

Name of Plantation.	Trees.				Total Expenditure to Date, including Cost of Trees from Nurseries.	Total Area planted.	Total Expenditure per Acre planted (including Cost of Buildings).
	Number raised from Seed sown in Situ.	Number received from Nursery.	Number used to replace Losses.	Total Number in Plantations.			
					£ s. d.	Acres.	£ s. d.
Whakarewarewa ..	109,725	20,602,850	3,976,264	16,736,311	105,256 5 3	7,983	13 3 9
Waiotapu ..	83,121	26,889,849	5,384,709	21,588,261	109,665 15 11	9,539	11 10 0
Kaingaroa West ..	..	599,870	..	599,870	6,058 16 6	502	12 1 7
Kaingaroa Plains ..	..	12,441,733	1,888,660	10,553,073	57,600 1 4	6,844	8 8 4
Puhipuhi ..	..	1,419,000	419,000	1,000,000	10,514 4 8	1,200	8 16 1
Conical Hills ..	..	10,751,401	1,465,105	9,286,296	57,996 6 1	3,533½	16 8 3
Pukerau ..	..	870,860	57,300	813,560	7,458 18 9	573	13 0 4
Dusky Hill ..	..	3,053,497	872,660	2,180,837	22,669 7 8	745½	30 7 10
Greenvale ..	..	2,070,345	185,125	1,885,220	27,953 2 8	1,132	24 13 10
Gimmerburn ..	..	936,235	783,339	152,896	6,874 5 10	88	78 2 4
Naseby ..	..	5,084,958	647,805	4,437,153	36,656 5 10	1,908½	19 4 1
Hanmer Springs ..	..	9,570,333	1,814,149	7,756,184	42,936 11 3	2,906½	14 15 6
Balmoral ..	..	2,207,547	598,440	1,609,107	25,767 9 7*	1,046	24 12 8
Raincliff ..	..	..	..	50,000	1,107 17 2	206	5 7 6
<i>Experimental Group.</i>							
Waitahuna ..	..	42,025	11,500	30,525	319 7 9	11	29 0 8
Tekapo ..	..	48,000	..	48,000	275 8 3	29	9 9 11
Dumgree ..	..	1,679,765	1,110,125	569,640	16,309 16 7	209	78 0 9
Galloway ..	..	6,930	3,050	3,880	84 19 10	2	42 9 11
Omarama ..	..	4,390	..	4,390	80 12 9	2	40 6 4
Totals ..	192,846	98,279,588	19,217,231	79,305,203	535,585 13 8	38,460½	..

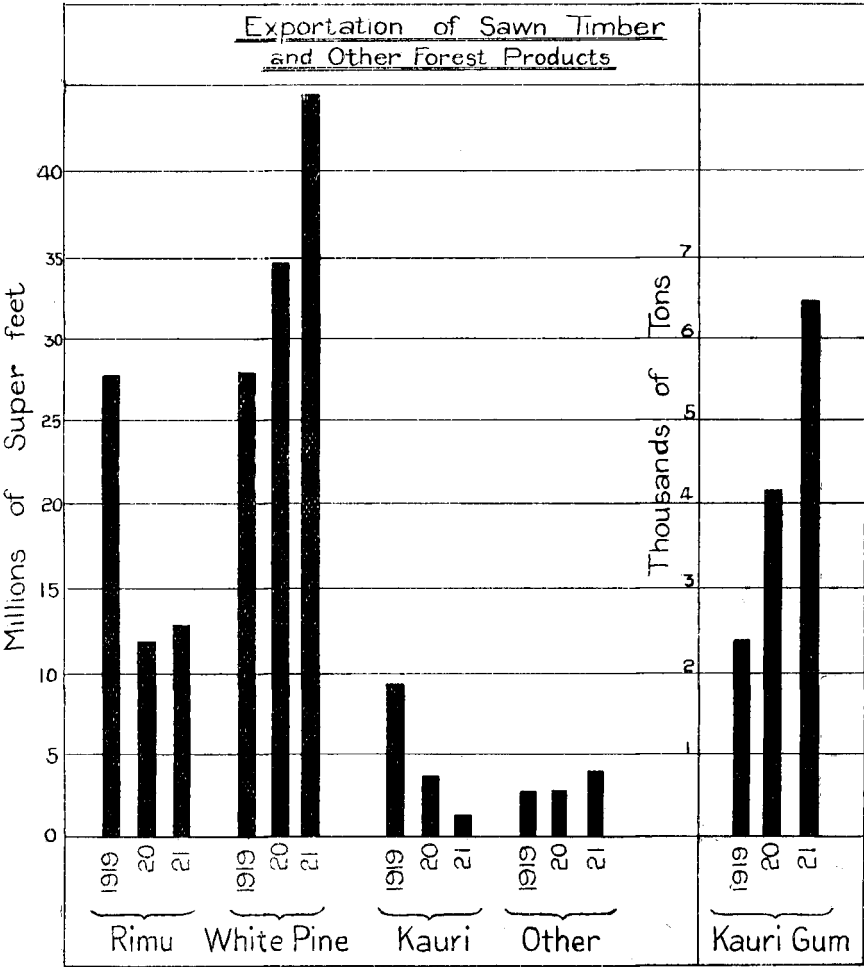
* Includes purchase of 6,499 acres at 10s. per acre.

ANNEXURE No. V.—REVIEW OF THE TIMBER INDUSTRY.

EXPORT OF SAWN TIMBER AND OTHER FOREST PRODUCTS.

(From information supplied by the Comptroller of Customs. All figures refer to the fiscal years ended 31st March, 1919, 1920, and 1921, except those for kauri-gum and fungus, these covering the calendar year in each case.)

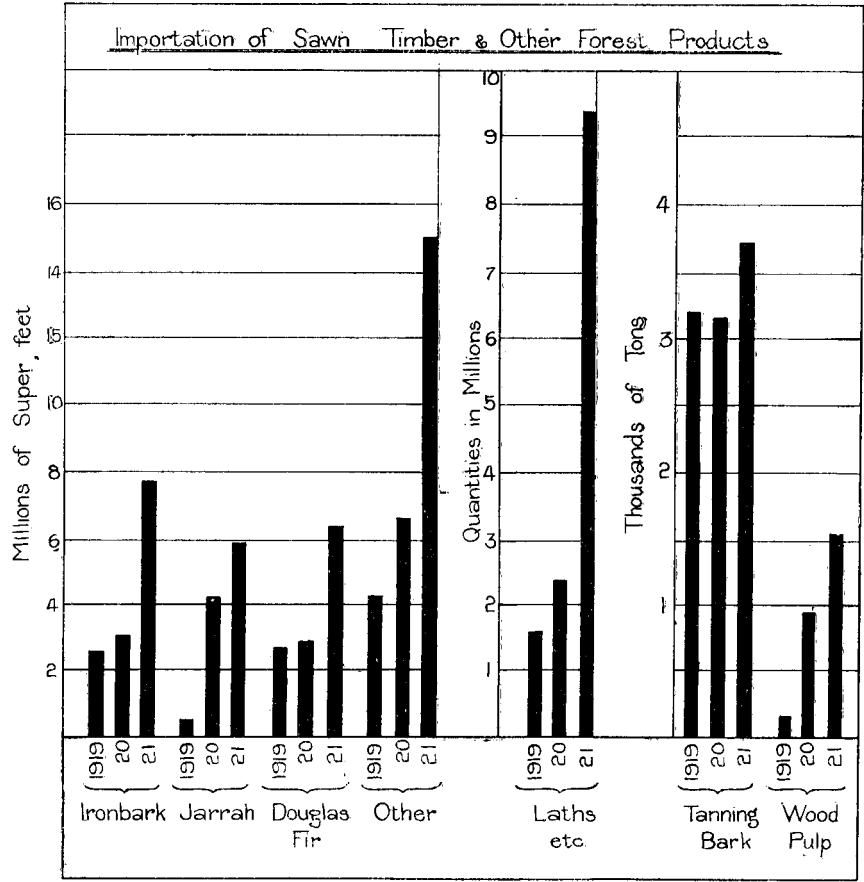
Item.	1919.			1920.			1921.		
	Quantity.	Per-centage.	Value.	Quantity.	Per-centage.	Value.	Quantity.	Per-centage.	Value.
	Sup. ft.		£	Sup. ft.		£	Sup. ft.		£
Kauri	9,280,213	13·51	97,084	3,719,610	06·84	45,763	1,201,455	01·91	19,019
Rimu	27,977,703	40·72	194,282	12,125,889	22·57	96,135	12,981,010	20·75	110,274
White-pine ..	28,385,105	41·32	233,680	34,827,162	64·82	317,150	44,382,691	70·88	474,757
Beech	1,254,091	01·82	10,670	772,661	01·43	7,266	221,395	00·35	2,578
Other (New Zealand) ..	1,797,425	02·62	16,224	2,264,588	04·22	18,362	3,822,401	06·10	37,971
Other (foreign) ..	2,566	00·01	33	15,092	00·12	269	2,450	00·01	97
	68,697,103	100·00	551,973	53,725,002	100·00	484,945	62,611,402	100·00	644,696
	Tons.		£	Tons.		£	Tons.		£
Tanning-bark	8	..	122	47	..	564	..	..	..
Kauri-gum	2,419	..	157,313	4,128	..	255,812	6,481	..	556,756
Fungus	103	..	5,784	49½	..	2,953	90	..	8,489



IMPORT OF SAWN TIMBER AND OTHER FOREST PRODUCTS.

(From information supplied by the Comptroller of Customs. All figures refer to the fiscal years ended 31st March, 1919, 1920, and 1921.)

Item.	1919.		1920.		1921.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Sup. ft.	£	Sup. ft.	£	Sup. ft.	£
Ironbark	2,606,442	40,474	3,100,575	58,395	7,819,857	152,291
Jarrah	668,362	7,473	4,199,964	49,610	5,918,063	97,166
Douglas fir	2,694,052	25,400	2,889,701	26,982	6,325,236	82,020
Other	4,209,218	76,581	6,676,302	145,465	15,155,910	396,979
	10,178,074	149,928	16,867,642	280,452	35,219,066	728,456
	No.		No.		No.	
Laths, palings, rails, &c.	1,572,744	5,457	2,332,182	6,373	9,373,235	22,156
	Tons.		Tons.		Tons.	
Tanning-bark	3,225	39,721	3,184	39,990	3,749	60,567
Wood-pulp	178	4,406	942	23,018	1,521	41,425



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