

1920.
NEW ZEALAND.

DEPARTMENT OF FORESTRY.

FOREST CONDITIONS IN NEW ZEALAND, AND THE PROPOSALS FOR A NEW ZEALAND FOREST POLICY

(REPORT ON), BY L. MACINTOSH ELLIS, B.Sc.E., C.S.E.E., DIRECTOR OF FORESTRY.

Laid on the Table of the House of Representatives by Leave.

CONTENTS.

SUMMARY OF REPORT	Page 2
SECTION I—FOUNDATION :—	
The Forest Resources of New Zealand	3
The World's Forest Resources and their relation to New Zealand	5
SECTION II—ORIENTATION :—	
The Case for a Forest Policy for New Zealand	6
SECTION III—RECOMMENDATIONS :—	
Synopsis of Recommendations	7
General Forest Policy	7
Detailed Discussion of Important Phases of Policy—	
Timber-sale Policy and Procedure	8
Technical Forest Training	13
Forest Investigation and Research	14
Inventory and Classification of the Forest Resources, Forest Lands, and Soils of New Zealand	16
Classification of Agricultural and Non-agricultural Lands in State Forests, &c.	17
Forest Lands of the Natives	17
The Forest Industry of New Zealand	18
State-forest Extension	19
Extension of Forests by Effort other than the State	20
Forest-protection Problems	21
Grazing within State Forests	22
SECTION IV—RECOMMENDATIONS (<i>continued</i>) :—	
Forest Act	23
Forest Service	24
Forest Finance	28
Forest Programme for Initial Five-year Period	34
SECTION V—RESULTS :—	
General Results of a Forest Policy in New Zealand	35
SECTION VI—APPENDICES	
	36

LIST OF ILLUSTRATIONS.

1. Map of New Zealand showing Forest-conservation Regions, &c.	To face p. 2
2. Graph exposing Consumption of Timber per Head in New Zealand	4
3. Map of World showing Location of Wood-export Surpluses	To face p. 6
4. Graph exposing Timber Revenues of New Zealand	28
5. Graph exposing Forest Revenues of British Columbia	29
6. Graph exposing Number of Trees distributed to Farmers and Local Bodies	32
7. Graph exposing Annual Output, Home Consumption of Timber	38
8. Graph exposing Timber Exports and Imports from 1900 to 1920	38
9. Graph exposing Annual Export of Durable Timber and Sawn Timber	39
10. Diagram exposing Royalties on Sawn Timber, 1885–1920	40
11. Graph exposing Annual Retail Prices of Rimu	44
12. Graph exposing Annual Retail Prices of White-pine	45
13. Diagram exposing Prices of Standing Timber in various Countries	45
14. Graph exposing Area planted annually by the State and Annual Cost	46
15. Graph exposing Total Area planted in New Zealand and Total Cost	47
16. Diagram exposing Disposition of Lands in New Zealand	48
17. Diagram exposing the Comparative Value of New Zealand Produce, Year 1915–16	48

REPORT ON FOREST CONDITIONS IN NEW ZEALAND, AND A CASE FOR A NATIONAL FOREST POLICY.

TO THE HON. THE COMMISSIONER OF STATE FORESTS.

SIR,—

The writer has the honour to submit herewith an analysis of the timber situation in New Zealand, and a case for a comprehensive Dominion forest policy.

In the preparation of this report the writer has visited practically every forest region and every important milling-centre. Interviews and expressions of opinion have been obtained from sawmillers, consumers of forest products, forest workers, Government officials, business men, bankers, development leagues, forestry leagues, farmers' institutions, academicians, scientists, &c. Existing legislation, administration of the public forest resources, Royal Commission reports, &c., have been analysed and reviewed, and on the ground have been studied the actual accomplishments of various forestry efforts, private and public, of the past generation.

In formulating a progressive forest programme for New Zealand due consideration has been paid to the policies and methods that have been successful in other countries similarly placed—Great Britain, France, Sweden, German Empire, India, South Africa, Canada, New Brunswick, Quebec, Ontario, British Columbia, United States of America, Australia; but the forest policy herein proposed for New Zealand is based on an independent and original consideration of New Zealand problems. It is not borrowed from somewhere else with the hope that it may fit in, but it is essentially a plan developed from and on the present and future needs of this country.

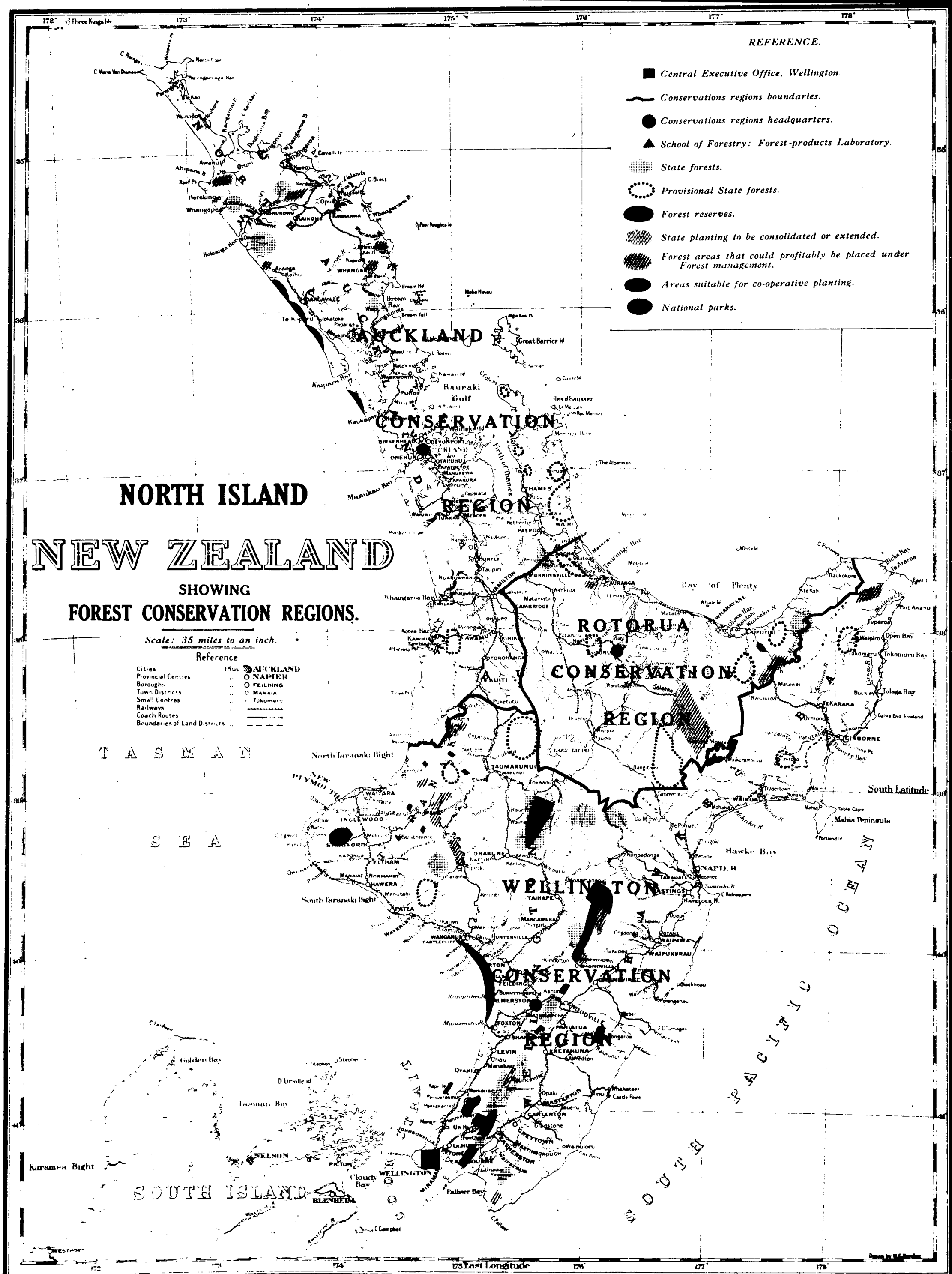
The writer considers that this policy is a practical, constructive, and well-ordered one; it fits in a place in the national economy which was heretofore vacant; and if this Dominion forest policy is worked out along the lines suggested herein it should solve the problem presented by forest-depletion in New Zealand. He therefore most earnestly requests your consideration of the practical measures composed in the accompanying report, and would particularly emphasize the conclusions as expressed in this summary:—

- (1.) New Zealand's visible supply of timber is estimated to be between 35,000 and 60,000 million superficial feet. The annual national consumption within a generation will probably be 1,000 million feet. In the interest of national prosperity every acre of forest on absolute forest soils should be placed at once on a sustained-yield basis.
- (2.) The world's visible supply of wood useful in the arts is limited—New Zealand's timber-supply problem must be solved by *action in New Zealand*.
- (3.) A definite forest policy is recommended by which continuity of action, and a stable and competent management, may be secured for a period of years. The following is proposed:—
 - (a.) A simple effective Forest Act.
 - (b.) A Forest Service.
 - (c.) A Forest Development Fund for forest development and demarcation.
 - (d.) The administration and management of all the Crown forests and forest lands by the Forest Service.
 - (e.) A progressive timber-sale policy.
 - (f.) Adequate facilities for technical education in New Zealand.
 - (g.) State co-operation in private tree-growing by various means, such as equitable taxation, forest fire insurance, forest fire protection, &c.
 - (h.) The administration and management of all scenic reserves, national parks, forest reserves, forested national and educational endowments, and forested Native lands by the Forest Service.
 - (i.) A Forest Products Laboratory and Bureau of Forest Research.
 - (j.) Survey and inventory of the forests, forest resources, and soils of the Dominion.
 - (k.) An economic survey of the timber industry and of the timber-using industries.
 - (l.) The administration and protection of the fish, bird, and game resources by the Forest Service.

Upon these proposals may be built a forest policy that should ensure the permanent and adequate supply of timber for New Zealand. Moreover, *the adoption of the principles involved should result in immediate increased forest revenue to the State, instead of increasing the drain on the public Treasury.* (There is abundant indication that the cost of operation should constitute a smaller and smaller percentage of the revenues yielded by the Forest Service.)

The writer hopes, for the sake of the continued prosperity and welfare of New Zealand, that his attempt to bring about a better state of affairs as expressed in this report will receive more than a hard-boiled and indifferent interest, and that the proposed remedial legislation will reach the statute-book in a sound, virile, and workable form.

L. MACINTOSH ELLIS.



SOUTH ISLAND
NEW ZEALAND
SHOWING
FOREST CONSERVATION REGIONS.

Scale: 35 miles to an inch.

Reference

Cities	thus	○ NELSON
Provincial Centres	...	○ HOKITIKA
Boroughs	...	○ TEMUKA
Town Districts	...	○ CLINTON
Small Centres	...	○ LYELL
Railways	---	
Coach Routes	---	
Boundaries of Land Districts	---	

T A S M A N S E A

South Latitude

CONSERVATION REGION

S O U T H P A C I F I C
O C E A N

S O U T H L A N D

CONSERVATION REGION

Stewart Island

REFERENCE.

- Central Executive Office, Wellington.
- Conservations regions boundaries.
- Conservations regions headquarters.
- ▲ School of Forestry: Forest-products Laboratory.
- ▨ State forests.
- Provisional State forests
- Forest reserves
- ▨ State planting to be consolidated or extended.
- ▨ Forest areas that could profitably be placed under Forest management.
- Areas suitable for co-operative planting
- National parks.

167° 168° 169° 170° East Longitude

SECTION I.—THE FOUNDATION:

FOREST RESOURCES OF NEW ZEALAND.

Actual knowledge of the extent of the commercial timber areas in New Zealand is scanty and very much scattered, for no consistent nor deliberate forest census has ever been made. Estimates which are *very much generalized* must be relied upon. (The need of definite knowledge of this resource is very apparent.) Various estimates or guesses of the commercial timber available in the Dominion range between 16 billion and 33 billion feet.

1913 Royal Commission Estimate.

The Royal Commission on Forestry, 1913, stated the following: "According to evidence before us the estimate of 33,060,883,000 superficial feet available in the indigenous forests in 1909 is at best a guess, and no one can truly say whether the amount be too much or too little. Our opinion is that it is not safe to conclude that there will be any supply of moment at the expiration of thirty years (1943) at the present time, and that unless more stringent methods are adopted to conserve the supply as far as possible the period of supply may be even shorter."

The same Commission estimated that the amount of timber consumed yearly in New Zealand at that time was 358,000,000 ft., and that notwithstanding substitutes for timber the *per capita* consumption in certain countries appears to be on the increase. This Commission, after assuming a doubling of population in thirty-five years, and taking the present demand for timber as a basis, estimated the future demand at that time at about 716,000,000 ft.

Preliminary Estimate.

The writer, after carefully considering and weighing past, present, and future needs and consumption, is convinced that the available supply of usable timber will be *very much higher than 35,000,000,000 superficial feet*. Enormous strides have been made in the discovery of new uses and methods of utilizing wood—such as, for instance, development of ply-wood, pulp-board, built-up products, wood-preservation, seasoning, manipulation, &c. These improvements open up vast opportunities for the use of the inferior timber-trees of New Zealand and its milling-waste; and where to-day not more than 25 per cent. of the ligneous material per acre is used in industry, in a few years' time this utilization *will probably exceed 65 per cent.*

Species formerly regarded as valueless are now valuable. The yield from an acre of land is now often double what it was in former years. Grades have gone down as prices have gone up. Processes have been developed by which waste may be converted into by-products of greater value than the timber formerly cut from the trees. In the past, wood was wood only: to-day it is known as a structure of countless cells filled with valuable materials for the use of man.

The Future.

Timber is cheaper to-day than it was three decades ago because of fuller utilization, broader markets, greater safety, and possible saving of cellular values which were lost. The up-to-date tree-utilization plant of the future will operate sawmills as an adjunct to the principal business of converting the chemical elements of wood into commercial products.

It must be further borne in mind that the modern scientific use of species of timber such as were at one time looked upon as without value, through better methods of logging and a vaster and constantly increasing market and demand, together with the increased utilization of waste, have combined to practically double the actual yield per acre of timber land. That is the answer to the cry of an imminent "timber famine."

Future Consumption of Wood.

However, within a generation the population of this country will probably exceed five million people, and on the basis of a probable consumption of 200 ft. *per capita* at this period the annual consumption of timber will be 1,000,000,000 ft., and even if the visible timber capital be 60,000,000,000 superficial feet it will be seen that considerable economies in utilization *must be introduced without delay*. The writer is convinced that this is possible, and may be effected in such a manner as not to inflict unreasonable hardships on the present generation.

In ten years' time it is estimated that if the State persists with its aggressive policy of dedicating the forests on absolute forest soils for the growing of trees it will have a virtual monopoly of the raw material.

The ownership of forests, according to the histories of other and older countries, carries with it an obligation on the part of the State to see that mountains and plains are not laid waste, because forests affect fundamentally the economic welfare of communities and the nation.

Fuller Utilization.

It is right, therefore, that the State should impose those silvicultural rules and manufacturing regulations that will ensure efficient conversion and clean utilization—for instance, such practical measures as clean logging, use of all merchantable material, disposal of slash, use of inferior trees for construction of logging-works, low stumps, high tops, protection of woods from fire, economical milling-machinery, as well as stimulating the use by the public of the low grades wherever possible.

The problem is blurred in the public eye because destruction, not construction, of forests has marked the nation's history. Because the first settlers in this Dominion found here more forests than they needed or could use they soon lost the habit, learned in Europe, of using forests sparingly. As a result, we as a people are to-day using several times the amount of wood *per capita* per annum that is used in many of the older nations of Europe.

Area of Provisional State Forests.

The probable area of absolute forest soils carrying potential or matured timber stocks is 8,000,000 acres. Of this quantity the State has now allocated as provisional State forests 4,610,000 acres; but it is necessary in the public interest that the total area be brought up to 12,000,000 acres. At this time it is impossible to state authoritatively the annual and sustained productive capacity of this land, but it is quite safe to say that all this aggregation, and more, will be required to be placed under forest management if a safety margin is to be attained against high prices and famine.

This land must be subjected to an orderly and regulated forest management. (The cost of conducting forest regulation without forest devastation will usually add to the cost of logging; in some cases it may be nominal, in other cases material. Whatever are the costs, they will be insignificant compared with the prices that the consumer already pays, and they will be altogether trifling compared with the prices which will have to be paid if unrestricted forest-destruction continues. For instance, in 1909 O.B. rimu sold in Wellington for 12s. 6d. per 100 ft., while in July, 1920, the price for the same material was 31s. per 100 ft.)

Classification of Forests.

The forests of New Zealand may be classified according to their sociological value: (1) Supply forests; (2) public welfare or protection forests; (3) recreation forest areas, regional plantations.

Under Class 1, which represents the purely commercial forest, there are only two main regional forest areas of prime consideration from a *national-supply standpoint*. The first is in the inland empire or central interior of the North Island, with Lake Taupo as a focal point. The second area is that region on the west coast of the South Island extending from Cape Farewell through to Milford Sound. Upon these two areas will the main work of forest-management be concentrated.

The local-supply forests are, and will be, distributed throughout Auckland, Wellington, Marlborough, Canterbury, and Otago Districts.

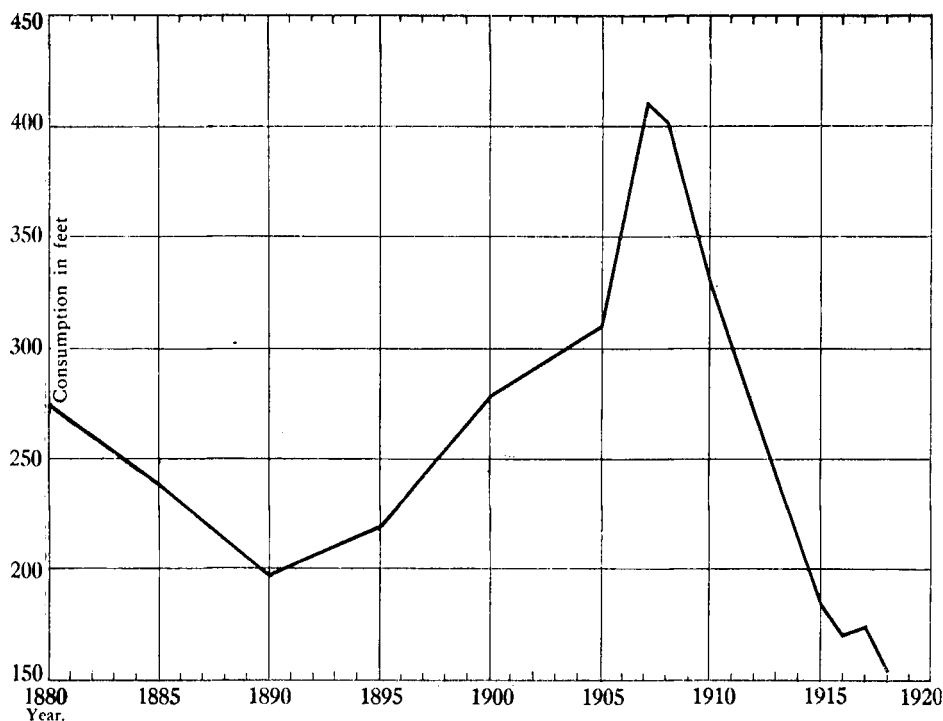
Class 2 comprehends chiefly forests for—(a) Regulation and preservation of stream-flow; (b) maintenance of climatic stability; (c) protection of the productivity of adjacent agricultural land.

The protection forests are located along the backbone of Hawke's Bay, Wellington, Taranaki, and Auckland, and on and contiguous to the Southern Alps or uplands of the South Island.

Class 3 includes—(a) National parks; (b) scenic reserves; (c) regional shelter-belts, &c. The forests of this class are distributed widely throughout New Zealand.

It will be apparent that classes 2 and 3 overlap.

All these classes of forests have become endowed with great direct public interest, and are, moreover, proper subjects for State regulation and control through its Forest Service.



CONSUMPTION OF TIMBER PER HEAD IN NEW ZEALAND.

THE WORLD'S FOREST RESOURCES AND THEIR RELATION TO NEW ZEALAND.

World statistics consistently indicate a steady increase in wood consumption and importation by nearly all the leading import countries. There are three countries which can increase their exports without lessening their forest capital—Russia, Finland, and Sweden. This increase will be needed in western Europe to make up growing deficits. The tendency is to overcutting by all wood-export countries, a policy which will sooner or later lead to universal shortage, with no surplus to draw upon. (This trend is now being offset by a new economic force—that is, the introduction of rational forest-management by all civilized peoples, for they find that they must make a diminished forest area supply an increased population.)

A concise *résumé* of the situation is about as follows:—

Import Countries.

(a.) Countries which with a highly developed management and important forest possessions themselves produce much wood, but in spite of this, on account of their important industries, cannot do without foreign wood. These countries are France, Switzerland, Belgium, and the German group. They are heavy competitors for forest supplies, and are rapidly increasing the amounts of their imports, *an increase which is certain to continue*.

(b.) Countries with a highly developed forest-management and a small domestic wood-consumption: Italy, Spain, Portugal, and Greece.

(c.) Countries with a small or unimportant forest-management and with small forest areas: United Kingdom, Holland, and Denmark.

(d.) Countries with poorly managed forests and not highly developed: Servia and Bulgaria.

Export Countries.

Russia: This country is not cutting anywhere near its "possibility" (the Director-General states that about one-half of the annual growth is cut). From European Russia will be drawn the supplies necessary for the accommodation of western Europe, and it is quite improbable that this source of supply will be of importance to New Zealand. It has been stated that "Apparently European Russia can supply all European needs, even if it increased threefold." This is very doubtful.

Siberia has a reported area of nearly 400,000,000 acres of forest land (71 per cent. coniferous and 29 per cent. hardwoods). This gigantic area contains a large proportion of water, swamps, and burns, and is located in poorly developed regions with insufficient means of transport. From what meagre reports that are available there is an inexhaustible supply of material in this great hinterland, but with the rapid industrial expansion of the Orient the probabilities are that its export offerings will be absorbed by China and Japan.

Finland: This country has a very high percentage of its land surface under forests, and is in a position to increase its wood-exportation, which will be largely absorbed by Europe.

Sweden is cutting to its limit, and it is doubtful whether its sphere of influence in the future will extend beyond Europe.

Norway has overcut its annual increment, and it is probable that export supplies will gradually shrink in the next generation.

Austria-Hungary group: Overcutting of the annual yield has been going on for some time, and this overcutting will have to be reduced if the capital stocks are to be maintained. In any event, its foreign offerings will be of only European value.

Rumania: Its small export surplus is absorbed in the Balkan region.

Canada and United States: It is estimated that Canada has a visible supply of merchantable timber of over 900,000,000,000 ft., but in considering Canada its relation to the great republic to the south of it must always be borne in mind. The close intimate relations that exist between these two countries will have a large bearing on the future timber conditions existing in North America. In the United States there is an estimated supply which would last that country about fifty years, and if the Canadian's visible surplus is included this period may be extended to sixty-five years. The American people are becoming vitally concerned over the prospect of impending famine, and at the present time the possibility of imposing restriction on export of timber is being discussed. But even if this were not done, and the export of timber was freely allowed, prices will very soon be on a luxury basis. The Canadian surplus easily finds its way into the American market, and from the standpoint of price for off-shore shipments no material difference is noted. The surplus of North America will be always eagerly absorbed by industrial Europe.

Other Countries.

China and Australia are importing countries.

Japan and India export valuable hardwoods and import large quantities of softwoods.

The Philippine Islands, Ceylon, Straits Settlements, Indo-China are too little explored to give any basis for definite predictions, but in any event their exports will be solely of valuable hardwoods which are not important here.

Africa exports only costly hardwoods, and the importation of softwoods is increasing in all but the central part. It is understood that there is an area of 400,000 square miles of valuable timber land in Central Africa, but much of it is at present quite inaccessible as far as the world's markets are concerned. The South African forests are entirely inadequate to supply home needs, and imports are bound to increase.

In South America there are vast untouched forests, principally in Brazil, estimated at 1,000,000 square miles. These great inaccessible forests will be opened up to supply home con-

sumption, but as development is costly it will be many years before these forests come to be an important factor in even South American markets. The South American countries will continue to export hardwoods, dye-woods, &c., and import lumber and construction material. Mexico, West Indies, and Central America are exporters of mahogany, cedar, and other valuable wood, and are importers of softwoods.

Summary.

Summarizing the world's timber position: There are five considerable areas of virgin timber-supplies which are of interest in considering the world's markets:—

- (1.) Scandinavia, the Baltic, and Russia, whose surplus is and will be largely absorbed by industrial Europe.
- (2.) Central Africa—of problematical value in this generation, and owing to the quality of the timber will be of little general use in the arts.
- (3.) South America: Its great reserve supplies will be largely absorbed on this continent.
- (4.) Canada, United States, and Alaska: From this region timber-supplies will no doubt be offered to us in New Zealand for all time, but at prohibitive famine prices. For all practical purposes this source of supply will not last more than a generation.
- (5.) Siberia: To this great region, with its 400,000,000 acres of virgin forest, we may look for a certain percentage of our imported supplies, but, with the intense competition that will certainly be offered for this timber by the countries north of the Equator, it is very doubtful whether its exportable supplies will be of much practical value to New Zealand.

The Conclusion.

“We must either go without essential timber-supplies, to the great hazard of our national safety, and perhaps with certain sacrifice of our industrial prosperity, or we must take immediate steps to assure ourselves an adequate supply of *home-grown timber*, which is perfectly practicable to-day.”

Extent of Forests in Different Countries.

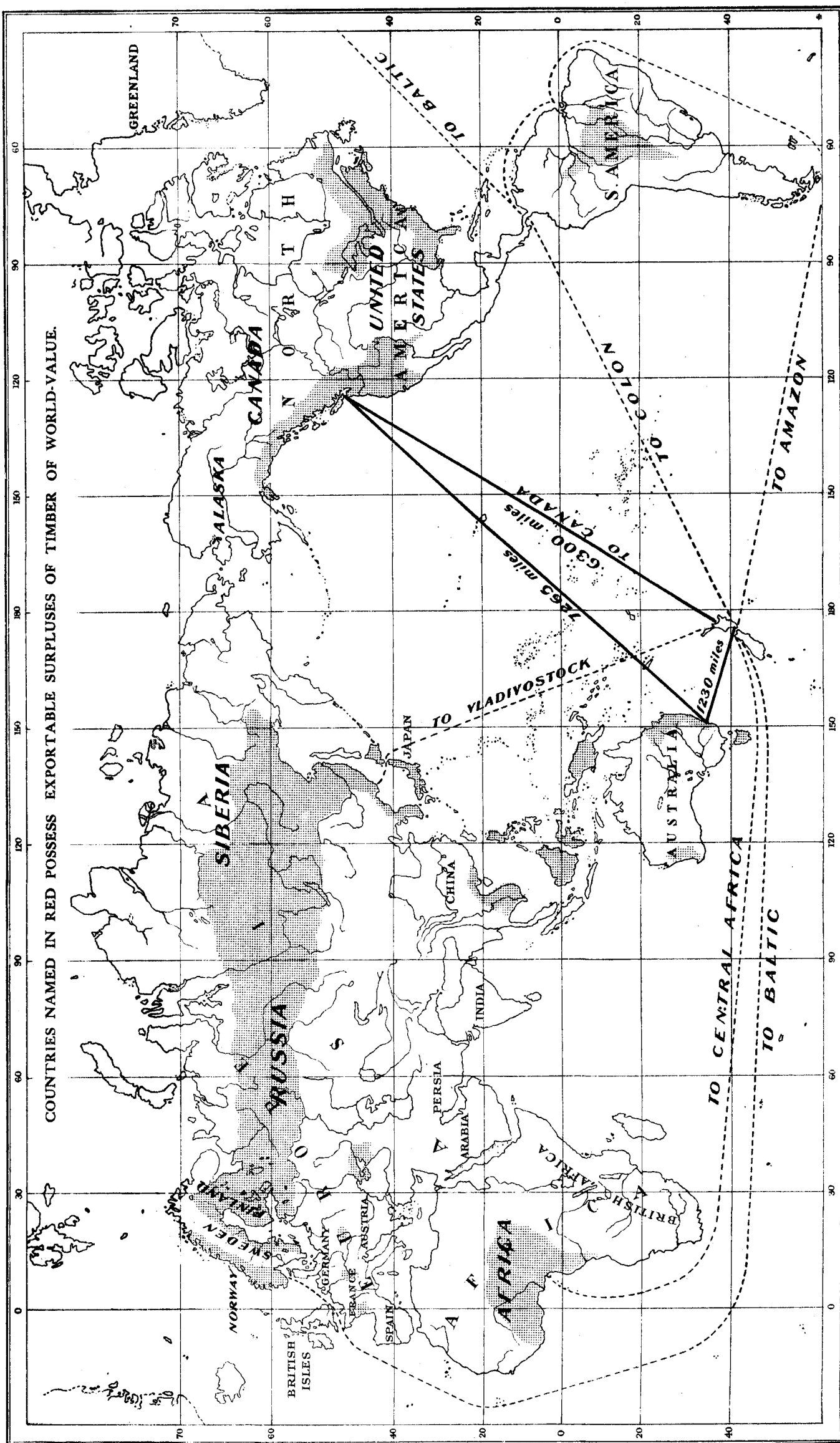
Country.	Total Forest Area.	Forest Area per Capita.	Land Area under Forest.
	Acres.	Acres.	Acres.
European Russia	464,610,600	4·3	36·30
Finland	52,500,000	18·75	54·40
Croatia and Slavonia	3,769,000	1·64	35·95
Bosnia and Herzegovina	6,380,000	3·99	50·50
Sweden	49,390,325	9·70	48·60
Germany	34,989,675	0·62	25·89
France	24,021,587	0·61	18·50
Norway	16,848,000	7·00	21·00
Spain	16,065,000	0·88	13·00
Bulgaria	7,602,815	2·44	30·00
British Isles	3,030,000	0·10	4·00
Switzerland	2,140,012	0·67	20·60
Servia	3,864,744	1·55	32·00
India (Schlich)	149,000,000	0·60	24·00
Canada	799,360,000	..	38·00
United States	545,000,000	..	29·00
New Zealand—			
Forests under State control ..	10,500,000	9·00	15·90
State forests	6,264,935	5·70	9·40

SECTION II.—ORIENTATION.

THE CASE FOR A FOREST POLICY FOR NEW ZEALAND.

- An inspection of the facts, figures, and references that have been presented indicate that—
- 1. Prosperity in peace and safety in war require a generous and unfailing supply of forest products.
 - 2. Unless and until land can be more profitably employed for other purposes it should be used for the production of forest crops, in order—
 - (a.) That the development of local-supply forests may be provided for;
 - (b.) To secure protection of stream-flow, to minimize drought, erosion, and silting (irrigation, water-power, domestic needs, &c.);
 - (c.) To assure ample supplies at reasonable prices;
 - (d.) That communities near forests may have permanent occupations and interests;
 - (e.) That hunting, fishing, recreation, and public health may be provided for.

COUNTRIES NAMED IN RED POSSESS EXPORTABLE SURPLUSES OF TIMBER OF WORLD-VALUE.



Wherever forestry—that is to say, the managing of timber lands as crops—has been practised for a long-enough time its results have shown themselves in increased production per acre and in *greatly increased revenues*: for example, Germany, France, Sweden, and Switzerland, the United States, New Brunswick, and British Columbia. Every principle involved in the successful systems inaugurated in other countries can with proper judgment be applied somewhere in New Zealand even now, and to maintain the forests of New Zealand in continuous production is easily practicable.

3. Forests are national assets, and must be treated as such, for their presence and use enters into the daily life of all the people. The transformation of productive forests into idle waste impoverishes the nation, damages the individual, is wholly needless, and must be stopped.

4. The problem of supplying the fundamental wood needs of the people must be solved by *action* in this country. Improved methods in handling timber lands require a change from that of regarding the forests as a mine to be gutted to that of a crop which can be perpetuated by management. Improved methods can only be secured after we have more definite and reliable information regarding our timber-supply, after the reorganization of the system of selling public timber, and after the causes of such forest waste have been analysed to see how and to what extent they can be removed.

5. The secure and steady operation of the forest industry is of vital concern to the public. For that reason the Government should have power to control the industry in emergency. In the public interest all the residual forest lands vested in the Crown as owner or trustee should be placed under an applied forest management if a safety margin is to be secured against famine, high prices, and genuine distress. The Dominion's timber-supply must be made secure.

6. The management of the present State forests and of the enlarged areas which the programme calls for demands an efficient organization. A New Zealand Forest Service must be formed and placed on a high basis of efficiency.

The fundamentals of a forest policy for New Zealand are exposed in the following pages of this report.

Your adviser earnestly recommends that the *principles as outlined be adopted and put into action without delay.*

SECTION III.—RECOMMENDATIONS.

GENERAL FOREST POLICY.

"The test of true conservation is not in the size of the forests or in the quantity of the timber standing thereon, but in the fitness of the plan of forestation to contribute to the most efficient possible utilization of the State's resources of land and capital, and to the most profitable application of the labour of its people. Conservation of any other kind would not be conservation, but waste."

A successful policy means much more than tree-growing. It must provide confidence and security in every legal and commercial phase to industry and public alike, with each scrupulous to refrain from suspicion and injustice. It must seek—

- (1.) The protection and beneficial utilization of our present forest resources in such a way that it makes them of larger service:
- (2.) Forest renewal on non-agricultural lands:
- (3.) Afforestation on lands now unproductive:
- (4.) Stability and improvement of conditions for forest workers:
- (5.) The assurance of sufficient raw material for the manufacture of timber and other commodities of almost universal use for the present and future:
- (6.) The dedication and protection of forest areas wherever the water conditions, soil-fertility, climate, and public health are dependent upon it.

The policy should also be framed in such a way as to—

- (1.) Ensure the consumer a maximum supply of timber at the critical time towards the end of the duration of the country's virgin forests and before new crops take their place:
- (2.) Exert a steadying influence on forest industry to prevent monopoly and extortion, overproduction, demoralization of the industry, wasteful utilization, and a safeguard of the interests of the small operator—all of which in the long-run injure the consumer and the areas in which the State forests are located:
- (3.) Fix terms for State timber attractive enough to permit the use but not to subsidize excessive cutting, and leave private areas intact:
- (4.) Be as simple and understandable as possible to public, purchasers, and Government.

It is an essential that the programme under which the policy acts be an aggregate of local programmes adapted to different conditions and correlated through the Government to meet the broader requirements of the whole country. Therefore in order to ensure a continuity of policy and a stable and competent management it is necessary that there should be a definite covenant for a period of years.

The following statement presents the basic requirements for the foundation and performance of a forest policy for this Dominion :—

General Needs and Principles.

1. Formulation of a simple and effective Forest Act—an Act which clearly defines the principles along the line of action.
2. A continuity and stability of forest policy over a period of years, with a delegation of authority to a competent Forest Service.

3. Formation of a consultative Forest Board to advise the Director of the Forest Service.
4. The assumption by the State of all forest lands remaining in the hands of the Natives, the classification of same, and the placing under permanent forest management of all forests on non-agricultural soil (in trust for the Natives).
5. A progressive timber-sale policy.
6. Development of a progressive policy as to roads and communication in and through the State-forests regions.
7. The management under co-operation of all educational endowment forest lands. (The superior facilities of the Service in the marketing of public timber should be here taken advantage of.)
8. The acquisition and dedication to forest management of further indigenous-forest areas, sufficient to justify a sustained-yield management for all State-forest units—a sustained-yield management that will satisfy the timber needs of the country.
9. The establishment of regulations regarding the utilization of timber for the prevention of waste and for the improvement of working-conditions of the forest industry.
10. The allocation of a Forest Development Fund for the execution of a forest policy over a period of years.
11. An appreciation by the people of what forestry means to them, and a knowledge of what they want.
12. The development by public bodies of a real, practical, and vital interest in and participation in the business of tree-growing.
13. A Forest Products Laboratory and Division of Research and Investigation to promote the most profitable and economical utilization of forest products, to aid in the management of the State forests, and to benefit wood manufacturers and consumers.
14. A progressive administration by the Forest Service of the national parks, scenic reserves, and other such State areas along recreational lines.
15. Permanent dedication of all public forests by Act of Parliament for the purposes of forestry.
16. The provision of adequate means and facilities for the education of technical officers and the force of the Service.
17. The adequate recognition by the State of its responsibility towards those counties in which State forests are located (national-supply forests), and an equitable partition of the revenues accruing from the management of State timber lands between the State and the local body (in lieu of taxes).
18. Delegation of the administration of the hunting, game, and fishing regulations, and protection of the game resources, to the Forest Service.
19. Protection of the free timber use of miners, &c.
20. The extension of co-operation between the State and the individual in stimulating private forestry.
21. Expansion of State-forest fire insurance.
22. Development of State-forest loan principle.

Operation.

1. A keen Forest Service, with a personnel of trained forest officials and men.
2. Demarcation and delimitation of all provisional State forests.
3. The development of permanent plans of management for all forests, planted or natural.
4. The unified control by the Forest Service of all timber forests and timber lands of the State; the sale and disposition of same; soil, examinations of forest lands, &c.
5. The development of an efficient forest-protection system by the Forest Service (control of fire, insects, disease, and trespass).
6. Control and management by the Forest Service of all grazing-areas within State forests.
7. Authority to permit the Forest Service to carry on investigations in or out of New Zealand in all matters concerning the status of forestry, forest development, utilization and marketing of timber (in so far as it is of direct value to this country).
8. Discretionary control of the operations of semi-public forest plantations by the Forest Service.
9. Provision for means of diffusing forest knowledge by the Service.
10. Provision for the widest use of returned soldiers in the Forest Service.

Special Projects by which Fundamental Data will be obtained to assist in establishing a Permanent Policy.

1. A comprehensive survey of the forest resources of the Dominion.
2. Land-classification and soil-survey of all forest lands.
3. Economic survey of the forest industry.

In the following pages of this memorandum the writer will endeavour to present in a more or less extended form some important and salient phases of the general forest policy.

TIMBER-SALE POLICY.

Past and Present Methods.

The method of public timber-disposal in vogue in New Zealand is characterized by indefinite policy, ambiguous regulations, and lack of imagination. Little or no serious effort apparently has been made to work out a businesslike plan of timber-disposition, with the exception of a few northern districts where all standing timber is sold on a basis of 100-per-cent. measurement, an upset price, and by public competition. A "leave things as they are" policy prevails in the

other districts, where, after the timber right has been granted, the exploited timber is paid for by the amount of sawn material produced or marketed.

In the sale of timber it is the applicant apparently that generally takes the initiative in selecting the area for license. This procedure is certainly not always in the public interest, and there are very many objections to it.

Royalty.—The severance-tax, or royalty, does not keep pace with the increasing value of the raw material; and, furthermore, no plan exists by which the State may automatically increase the selling-price of its raw material as the selling-price of the manufactured product appreciates. The result is to-day that the State is not receiving the full market value of its timber resources, and it is also losing (by virtue of subnormal royalties) in extravagant and careless exploitation in the woods and mill. Low royalties and low stumpage mean to some extent "butchery," for the miller is not penalized for sloppy and inefficient methods, as he pays only on the sawn output.

It must be said, however, that administration costs are very light, but at the sacrifice of efficiency and economy. The standing timber of the country has been treated as a "mine" and not as a resource to be "cropped."

Briefly, the situation is as follows:—

- (1.) The State is not getting its due share of the profits of production, and present cutting can, without damage to the future, yield increased revenue.
- (2.) Uneconomical and inefficient methods of forest exploitation often prevail. (Low standing-timber value is often harmful to careful logging.)
- (3.) The forest industry has not stability of policy, nor a definite future basis for operation.
- (4.) In all overmature stands of timber the decay offsets the annual growth, so that the future is not benefited by "storing," and all possible present revenue within a sustained annual-yield basis which is not taken will be irrevocably lost. (Generally speaking this is the case, but a compromise must be made where the future supplies may only be assured by storing. The State forests should be made the best possible examples of forest management, and allowing overmatured timber to go to waste is inconsistent with such policy.)
- (5.) In the majority of the land districts of New Zealand timber royalties are collected on the mill-output, and in only a few districts is the timber sold by accurate appraisal and on a measured estimate.
- (6.) Although the ground is earmarked for sawmill licenses and reservations for periods varying from twenty-one to forty-two years, practically no payment is made for this concession. A nominal rent of 1s. per acre per annum is charged on sawmill areas granted under the Mining Regulations; but where royalty payments accruing due exceeds this the rent is merged in the royalty. The same rent—i.e., 1s. per acre per annum—is charged on the reservations attached to each sawmill area granted, but this is not merged in subsequent royalties to be paid.
- (7.) Considerable trafficking is going on in timber rights. This is due to a large extent to the indifferent and poorly developed regulations. It is evident, but difficult to prove, that some aggregation of sawmill leases is taking place. This should not be possible, and under a definite, clean-cut system of administration would not be possible.
- (8.) Only casual or nominal inspections of forest exploitations are made.
- (9.) The State is losing considerable areas of timber land every year by devastating fires.
- (10.) The State is concerned, by virtue of its ownership, in the sale of raw material in the round. It is not sold in the round. It is *the log*, as a commercial product in itself, that should interest the vendor, the State. The principle of collecting the royalty on the mill-output is not on a sound basis. It presupposes that all round material will be converted into sawn timber. This will certainly not be the case (development of pulp and paper plants, tannin-extract works, wood-distillation, &c.).

What must be provided for.

A complete reformation is needed. All old archaic methods and regulations must be scrapped, and a progressive and modern procedure brought into play through the organization of this Forest Service. Under a new order of things the State must bear its burden of responsibility in perpetuating the use of the country's timber resources. If it accepts this earnestly and sincerely it will be necessary for the Forest Service to take the initiative in all matters pertaining to timber-disposal.

The management should be such as to ensure for the people of the nation a fair return from the sale of its natural resources, at the same time considering the interests of the timber industry and of the consumer. It is fortunate indeed that the principle of State-timber royalties has been long in vogue in New Zealand, inasmuch as it introduces the principle of profit-sharing by the people in the industries which develop the natural resources.

The timber-sale policy should be one that gives a fair and just measure of certainty to concessionaires, and therefore stability to the forest industry. It should provide for a more equitable return under present conditions, and for greater and greater increases in the future under the profit-sharing principle. It must cope with actual forest conditions, and should, among other things, provide for—

- (1.) The welfare of all the people in this country to the highest practical degree as far as the sale of public timber contributes to their welfare.

- (2.) The settlement of this timber-sale business by eliminating definitely and fairly the uncertainties which have disturbed and hampered forest industry. The Government should co-operate to the fullest legitimate extent in establishing and maintaining a permanent and profitable timber industry within the Dominion. The interest of the Dominion is so bound up with the timber-manufacturers' interests that nothing can be done to suppress in any degree the activity of the latter without endangering a vital interest of the former.
- (3.) The businesslike administration of the timber resources.
- (4.) Reasonable regulation of forest exploitation on public forest lands, in order to secure to the people a full measure of the exploited values, and, if need be, to ensure perpetuation.
- (5.) The considered and reasonable use of the State-forest resources in such a manner that every facility is given to the actual and *bona fide* miller to allow adequate investment and profitable return, and so as to make forest conservation not a remote but a near and more profitable thing upon all areas upon which milling is carried on: for in the last analysis the test of the success of the forest policy of this Government will lie not merely in the present productiveness, but still more in the future productiveness of the forests themselves.
- (6.) The settlement of local questions upon local grounds—in each case, of course, considering the dominant industry, but with as little restriction as to minor industries as possible. Sudden changes in industrial conditions should be avoided by gradual adjustment after due notice.

These general principles should govern not only in the disposal of timber and wood, but also in all other matters connected with the management of the public forests, such as protection and use of the water-supply, judicious use of the grazing resources, &c.

Recommended Proposals for a Progressive Timber-sale Policy.

Your adviser herewith exposes proposals for the formulation of a new timber-sale policy. It takes into account the approach which all other countries have made upon the problem of disposing profitably of the public timber. The recommendations typify an independent and original consideration of the problem in New Zealand, and the resultant will not be a borrowed instrument taken from somewhere else in the hope that it may fit into local conditions. The policy as finally decided upon should take cognizance of the following suggestions and statements if results are desired:—

1. The Forest Service should be the one branch of Government ministration empowered and made responsible for the control, disposition, and sale of *all* the forest resources of the Dominion, whether in State forests, forest reserves, or on sawmill licenses, leases, rights, &c.

2. An immediate reconsideration of the present royalty rates should be made, and legislation passed so that an early adjustment can be made in these basic values over all sawmill licenses, timber rights in Mining Wardens' areas, leases, &c.

3. The general principle of readjusting the royalty charges periodically should be adopted. This readjustment should comprise the following:—

- (a.) Fix the royalty increase as expressed in paragraph 2 above.
- (b.) Establish a level of wholesale timber-prices on which future increases will be based.
- (c.) Ensure stability by providing, say, by several successive five-year periods, for periodic royalty adjustment. For each of these given periods it should be provided that a certain definite percentage of the price-increment for timber shall be added to the royalty. (In British Columbia, where this system is now in force, the percentage is 25 per cent. for the first five years, rising by increments of 5 per cent. to 40 per cent. for the last five-year period.)
- (d.) Provision for standard grades, measurement scale, the power of inspection into the affairs and books of the operator (for determination of the average selling-prices).

NOTE.—This periodical adjustment in royalty should be based on the wholesale selling-price of timber during each past five-year period. The wholesale selling-price of timber should be calculated at the point of manufacture as f.o.b.; therefore, in order to obtain a reliable basis, a yearly record of timber-sales should be kept by each operator. This system gives a fair and just measure of certainty to concessionaires; it is based on sawn-timber values, cost, and fair profit to operators; it ensures stability for financing, recognizes the fundamental right of the people of New Zealand to share in the increasing value of their own timber property, and it is a good forest-conservation principle.

4. *Ground-rent.*—A Dominion-wide ground-rent should be charged on all sawmill licenses and reserves, Mining Wardens' leases, &c. In these cessions great areas of public lands are earmarked, and are therefore controlled by the licensee or lessee for periods ranging from twenty-one to forty-two years. It is therefore right and proper that a fair and just annual ground-rent should be charged. It should represent the annual interest (say, $5\frac{1}{2}$ per cent.) on the capitalized value of the land held under license. This ground-rent should not be regarded as a penalty for the non-use of the timber resources on the land (as in the case of Mining Warden timber leases), but as the just return that the people of the country are entitled to in giving a land-monopoly privilege to any one citizen. The writer suggests the imposition of a ground-rent of 1s. per acre per year, the same to be paid annually at the same time every year by all licensees, and at the same time renew their timber right or license.

5. The system of disposing of public timber, whether on State forests or elsewhere, should consider the following principles:—

- (a.) The Minister of Forests should prescribe from time to time, on the advice of his Director of Forest Service, the maximum amount of matured and large-growth timber which may be cut, by years or other periods, on each State forest or unit. Up to the limit of this amount the Forest Service should be empowered to dispose of same, but no sale should be made until the approving officer is satisfied that practicable methods of cutting could be prescribed which would preserve the living and growing timber, promote the younger growth, and secure as complete utilization of the various species and grades of material as is compatible with existing market conditions.
- (b.) All merchantable material should be cut on all lands classified as agricultural.
- (c.) All dead, fire-damaged, insect-infested, and badly diseased timber should be sold as soon as possible.
- (d.) The sale of overmature and deteriorating timber should be hastened.
- (e.) *Only those restrictions should be imposed upon operators which are essential to the silvicultural management of the forest, and as far as practicable the silvicultural requirements should be adapted to the established and necessary methods of logging in the region.*
- (f.) Utilization should be required on all sales of such sizes and grades of material as can be practically marketed by an efficient operator.
- (g.) No timber should be sold for less than its appraised market value, and the Director should fix from time to time the *minimum* stumpage prices at which timber shall be appraised.
- (h.) Sales of timber in small quantities should be encouraged by every means possible, and the period allowed for the removal of the timber should be fixed in the agreement.
- (i.) All contracts exceeding five years in duration must contain a provision for the *reappraisal of stumpage prices* at intervals of five years. Generally speaking, additional areas should not be earmarked for any one operator, but agreements may provide that in addition to the timber purchased a specified area may be reserved from sale until the termination of the contract, and then appraised and advertised. As far as practicable the rate at which timber is sold from any unit should ensure a reasonable operating life for new mills constructed in connection with sales. Dominion forest timber should not be administered so as to give particular mills a monopoly, but the amount to be cut from year to year should be regulated so that established plants, if successful competitors for timber offered, can be assured continued operation for reasonable periods.
- (j.) *No sales should be made which endanger the future supply for local use or the maintenance of local industries.*
- (k.) A minimum yearly or periodical cut should be required for each contract.
- (l.) Before any timber is advertised or sold it should be examined and appraised, and the cutting-area described for legal subdivisions or otherwise. The quality and appraisal value of the various kinds of timber on the area should be reported upon. The appraisal should be based upon the character of the timber, the cost of logging, transportation, and manufacture, the investment required, the degree of hazard, the sale value of manufactured products at practicable markets. There should also be reported upon the contract conditions necessary for silviculture, fire protection, utilization, and other Dominion forest interests.
- (m.) The stumpage rates charged should be the actual market value of the timber, and should be based upon the items mentioned in (l).
- (n.) All timber cut from any given area should be scaled and stamped before removal by a licensed timber-measurer.
- (o.) The contract agreement between the Government (as represented by the Forest Service) and the purchaser of stumpage should contain such points as utilization specifications, measurement practice, disposal of slash, precautions against fire, use of tramways by other purchasers, reappraisal of stumpage prices, reservations for scenic or recreational purposes, responsibilities, and penalties. All logging and milling operations should be subject to inspection by the Forest Service, for a most important point of forest administration lies in constant field inspection. It is necessary for the following reasons: (1) To secure a close working co-operation between exploiter and forest officers; (2) to enable the users of timber lands to transact business readily with the Government; (3) to induce adherence to the principles of cleaner logging, encouragement and protection of young growth, and more economical milling, prevention of trespass, &c.; (4) to raise the standard of exploitation to that set by the most progressive and careful operators.
- (p.) Adequate safeguards should be provided for the prevention of monopoly; also statements as to the financial standing of purchasers, provisional bonds, &c.

6. The standard unit of measurement which should be established as a statutory rule for the measurement of all timber products is the *solid cubic foot*. All standing timber should be offered and sold on a basis of what the *actual use volume* of the tree is under bark, for it is the log as a commercial product in itself that the State is interested in. Timber should therefore be scaled with the solid contents as a basis, considering, of course, the defects and indications of defects

in the log. It should not be scaled in relation to the grades to be manufactured from it, nor on the basis that only material calculated to produce certain grades of timber is merchantable. The solid-cubic-foot unit of measure is stable, and stands for all industries, whether sawmills, pulp and paper plants, tannin-extract plants, or any other form of activity using wood, and with this unit the individual judgment is not called into play as much as with the present system. Furthermore, selling and measuring timber at the source ensures cleaner and better utilization, for a premium is set on extravagant waste by virtue of this fact. It is simple, effective, direct, and fair to everybody. Each particular user, of course, would have to establish his own utilization factor; and to say that these users would have difficulty in establishing such factors would be a reflection on the knowledge of their plants and their efficiency. As well say the freezing-works manager should buy his sheep in units of dressed mutton because he is unable to figure the loss in dressing. It would be just as fair to the farmer as to the present log unit (Hoppus quarter-girth, or sawmill output). Practically all the large timber-producing countries of the world have adopted the solid cubic contents as a basis for timber-measurement—for instance, France, Germany, Norway, Sweden, India, South Africa, United States, &c.

7. *Fire Menace*.—In certain forest districts the fire menace is a serious one, and for that reason it should be stipulated in every timber contract that proper precautions are necessary on the part of the operator to minimize the fire danger resulting from his logging slash and debris. In addition, by virtue of the interest of both parties in the timber, an equal levy should be made for fire-protection expense, the Forest Service, of course, being responsible for the personnel, administration, &c. This forest-fire levy should be made also against all timber concessions made under existing legislation.

8. So that all timber cut on public forests may be traced through to its origin in cases of dispute in royalty payments, &c., a "timber marks" regulation should be incorporated. Under this regulation all timber cut from any one timber-sale, or from any one particular lease or license, would be stamped with a distinctive mark, and, of course, each mark would be registered at the time the sale was made.

9. Increased supervision over logging and milling operations will be found to be a most remunerative form of investment, and will yield very definite returns in immediate forest revenue.

10. Your investigator strongly recommends the introduction of a *system of licensed timber-measurement*, and it should be compulsory upon every purchaser of public timber who cuts more than 250,000 ft. per year to employ a properly licensed and certificated timber-scaler, which scaler will be entirely responsible for the measuring of all timber cut on timber-sales, and he will make his definite returns to the Forest Service, instead of under the old system where the proprietor submitted his sworn statement. The licensed-scaler system under proper supervision has always been found to be the best procedure. It would be necessary to appoint an Examining Board, by whom the prospective candidates would be examined and, if successful in passing the necessary tests, would be granted certificates and licenses to carry on as timber-measurers. Frequent inspections and check scales would be made of their work by an officer of the Forest Service, and if it was found that they were not carrying on as laid down by the Service their licenses would be revoked. In lieu of the employment of a licensed timber-scaler, an official scaler of the Forest Service might perform all necessary measuring at a stipulated fee.

11. *Perpetuation of Timber Rights*.—All timber concessions in vogue at the passage of a new forest law should be made renewable from year to year, and transferable in perpetuity as long as any merchantable timber remains on same, the areas are not required for settlement, and the other conditions, such as ground-rent, royalties, and regulations, are observed.

12. All timber concessions made under a new forest law, and all timber rights perpetuated as in paragraph No. 11, should be subject to the following rents, royalties, and other burdens:—

- (a.) Annual ground-rent of 1s. per acre.
- (b.) All timber cut to be subject to a royalty.
- (c.) All timber offered for sale to be subject, in addition to the royalty, to a bonus or premium, which would represent the competitive market value of that particular parcel of timber over and above the royalty.
- (d.) All timber land under license or sale to be assessed for fire protection on a per-acre basis.
- (e.) All expenses in connection with the surveying, appraisal, and advertising of each sale to be paid by the successful tenderer.

13. Provision for adequate penalties for non-observance of Timber-sale Regulations.

Review of Timber-sale Policy.

A brief review of the suggested timber-sale policy is as follows:—

1. The Forest Service to be the one Government agency solely responsible for the disposition and sale of all public timber.

2. All timber to be sold at public competition on an upset price per volume unit to the highest bidder, and by measurement in the round: 10 per cent. of total bid to be paid on acceptance, and balance as timber is cut.

3. Each proposed timber-sale to be properly cruised, estimated, and appraised, and surveyed or properly demarcated by this Forest Service before offering for sale.

4. All timber rights now in existence or granted in the future to be subject to ground-rent, royalty, fire-protection tax on a per-acre basis; and in the case of new sales the successful tenderer should pay the cost of surveying, appraisal, and advertising, as well as a premium representing the difference between the royalty and the competitive market value of the timber.

5. No timber-sales to be made generally for a longer period than five years, but in exceptional circumstances, where the development expense would be heavy, this time may be varied at the discretion of the Director of Forest Service.

6. All timber to be marked and properly measured by a licensed scaler before removal from the timber area.

7. All timber to be measured by the solid-cubic-foot rule, and all timber to be sold on this basis.

8. All existing sawmill licenses and Mining Wardens' licenses to be made perpetual by a renewal license from year to year as long as any merchantable timber remains and the areas are not required for settlement.

9. No timber-sale contracts to be transferable or assignable. They should be regarded as a contract only between the Government, as owner of the timber, and the user.

10. Every effort should be made to secure for the public the full market value of the standing timber, and speculation by purchasers of public timber must be discouraged.

11. The Forest Service, within reason, should have full charge of the silvicultural policy over all timber-sales, and to the extent of protecting the public interest should be granted sufficient supervision over manufacture to require the use of efficient machinery for the prevention of waste, &c.

12. A delegation of authority should be given to the Forest Service to enable continuity of policy, development of efficient methods, the elimination of "red-tape," and the formation of a capable, efficient, and knowledgeable staff of officers.

Results.

If a timber-sale policy is developed along these lines there should result a well-ordered system of selling Government timber, with immediate increased definite returns in forest revenue. It will ensure to the miller stability of tenure, and will place the operator in a position to finance adequately his operations. It ensures continuity of policy, and will help measurably in placing the forest industry of New Zealand on a sound and permanent footing. It ensures to the people, the manufacturer, and the consumer a fair and just management. In short, it means the greatest good to the greatest number in the long-run.

TECHNICAL FOREST TRAINING.

It has been suggested by certain laymen that a forest school in New Zealand is an unnecessary and needless expense, on the ground that only a small number of technicians would be required, and therefore it would be more economical to send abroad as needed promising material to be trained at any of the many forest schools of Great Britain, United States of America, or Canada. Your adviser submits that this expression indicates a woeful lack of knowledge, vision, or imagination, and that this sentiment results from a too-slavish adherence to old-fashioned, mid-Victorian ideas and methods.

After a careful consideration of the forest problems that must be solved in New Zealand, and the needs of the present and future in the execution of a forest policy, your investigator (with a rather extensive acquaintance with forest education and forestry progress in other countries) *unreservedly advises that a forest training centre be established without delay in New Zealand.* Experience in other countries where forestal conditions and development are similar to those in New Zealand has proven that *progress in the successful solution of forestry problems is gauged by the supply of technically trained forest engineers and officers.*

The expenditure of £3,000 per year in establishing and maintaining a Chair of Forest Engineering and a State Ranger School at Canterbury College (officered by a Professor of Forestry and an Assistant Professor) should provide ample facilities for the graduation of five to seven forest technicians per annum, and from ten to fifteen forest rangers. "At a later date when trained officers are available to carry on instructional work the Canterbury State Ranger School might be moved to the West Coast, and a second State Ranger School established in the North Island. However, for the first five years there is no reason why all forest education work should not be carried on at Canterbury College."

The writer estimates that this number of graduates may be absorbed into the Forest Service activities alone (not considering private employment) every year for a generation. If, however, trainees must be sent abroad the cost will be at least this and more, and the services of the undergraduates would be lost during the period of training.

The general principles of the science and art of forestry may be taught readily in New Zealand, and at the same time the student is receiving practical instruction in the many complex problems so peculiar to forestry in New Zealand. It is essential that during the educational period a knowledge of local conditions be allowed a chance of striking deep root.

In addition to providing instruction in forest engineering for the training of Government forest officers, due regard should be given to technical instruction in the economy of the forest industry, for the leaders of thought in this great industry are beginning to appreciate the fact that "Science is the willing handmaid of Progress," and that trained brains in co-operation with the "practical man" get results. "In a few years the timber engineer will become the leading man in forest industry. He will become the directing and driving force in converting standing timber into useful products." Instruction should therefore be provided for—

- (1.) The full technical training of forest engineers destined to occupy the senior *executive and administrative positions in the Forest Service*, or in other organizations using trained forest engineers.

- (2.) That required by forest rangers, forest guards, woods foremen, &c., tree-planting experts, nursery foremen, &c.
- (3.) Special instruction for private owners and operators of woodlands, timbermen, and others who desire work in special lines or can use only a superficial knowledge of technical forestry.

The following courses of instruction should be provided :—

- (1.) A four-year course designed to train students for the practice of professional forestry in its broader phases.
- (2.) A short course of one year designed for men employed as forest rangers, guards in the Forest Service, or for men in the employ of forest-exploitation companies who desire such training as will enable them to carry on their work more efficiently.
- (3.) A four-year course designed to train men for work as logging and milling engineers with sawmilling concerns, with consulting engineers, in the Forest Service, &c.
- (4.) Special courses could also be given in such subjects as—Pulp and paper making; dry-kiln engineering and plywood manufacture; timber-grading; management of farmers' woodlots, scenic reserves, parks, &c.; timber-appraisal; forest utilization (general); forestry for civil engineers; short course in forestry for agricultural instructors and others who might desire to prepare themselves to give instruction before technical schools, high schools, &c.; distribution and marketing of forest products; wood distillation and extraction; history and economic aspects of forestry; forest nursery practice and tree-planting; kauri-gum recovery, extraction.

The forest school, in addition, should be prepared to give instruction and advice by means of lectures, exhibitions, and demonstrations throughout the Dominion; to issue publications, bulletins, and circulars, and to give expert advice to private owners who may desire to practise forestry or engage in milling; to generally assume the position as leader of progressive academic thought along forestry lines.

FOREST INVESTIGATION AND RESEARCH.

The formation of a strong research division is absolutely necessary if we are to make any advance in the solution of the forest problems of New Zealand. *This cannot be urged too strongly.* One has only to review past achievements of forestry in New Zealand to see that the one great vital thing lacking has been systematic observation and study. During the past twenty-five years £300,000 has been spent—earnestly and sincerely, it is true—but the sum total of all that expenditure is 35,000 acres of planted forest. No investigations have been made as to the fundamental requirements of forestry as applied to the great indigenous forests. To-day *we must start from zero* and gradually build up a knowledge upon which our programme may be based. In forestry we are dealing with nature and time, therefore the study of nature's *modus operandi* must be begun at once, so that by the time the State forests are demarcated it will be definitely possible to prescribe the finer details necessary for their management.

In scope the investigations should cover activities such as silviculture, including reforestation; tree and shrub distribution; volume and yield measurement; forest influences; protection from fire, insects, and disease; exploitation methods and costs; stumpage appraisals; dendrology; grazing; kauri-gum resources, &c. In general, those studies of particular problems should be undertaken which are of practical value to the Forest Service, to sawmillers, and users of forest products.

The work of investigation falls actually under two heads—namely, “Silvicultural Investigations” and “Investigations in Forest Products.” The machinery necessary to successfully undertake the various problems includes a Forest Experimental Station and a Forest Products Laboratory. As far as possible the investigative work of a technical and experimental character should be conducted at the Forest Experiment Station or the Forest Products Laboratory.

Forest Experiment Station.

The purpose of the Forest Experiment Station is to establish fundamental principles or laws which may be generally applied, and not merely to study local products. The formulation of permanent plans of management of the State forests will be naturally hastened by accurate forest descriptions (silvical) of all forest types and characteristics of species composing them. Without this basic data as to the formation of forest types, their performance when disturbed, and the succession leading up to the old climax type, little can be done. The following ground should be covered:—

- (1.) The forest: (a) Complete list of trees; (b) complete list of shrubs; (c) the permanent types and the factors which differentiate them—climate, soil, altitude, and topography; (d) a silvical description of each type, to include proportion, soil, climate, and site, forestal characteristics, composition, interrelation of various species, even or uneven—aged stands, &c.; external influences operative in the type—fires, grazing, storms, &c.; recommendations for silvicultural management; results of former cuttings, how they can be improved; the presence of temporary types; cause, and life-cycle of each.
- (2.) The individual species: (a) Habit, diameter, height, crown, bole, root-system; (b) occurrence, distribution, effect of altitude, soil, &c.; (c) soil-moisture requirements; (d) tolerance of shade; (e) growth and longevity; (f) reproduction.
- (3.) Study of cut-over areas.
- (4.) Forest-distribution.
- (5.) Insect infestation.
- (6.) Tree-diseases.

Among the many specific problems of great economic value which should be concentrated on during the next five years through the Forest Experiment Station are—

- (1.) The wood-borer—means of combatant control.
- (2.) The fixation of sand-dunes, and the economic utilization of the 500 square miles of sand-dunes in this country. This is a very important matter, and one that should be immediately dealt with. A definite appropriation of, say, £1,000 per year for five years should enable this Service to solve this problem.
- (3.) The development of farm forestry—what species to use, and study of methods of extraction, and of the best procedure for the farmer to use in developing his 5-acre or 10-acre woodlot.
- (4.) Investigation into the incidence and burden of taxation on timber land and plantations.
- (5.) Investigations into the lumber industry—logging, milling, and marketing, development of cultural regulations such as brush-disposal, fire protection, seed-trees, &c.
- (6.) Nursery practice, planting experiments, &c.
- (7.) Tree-seed selection, testing, &c.
- (8.) Determination of the mortality of residual trees after cutting by selection; under-planting value, &c.
- (9.) Cost of exploitation in the woods and the mill of various-sized logs.
- (10.) Life of woods and mill tools and equipment, considering wear and obsolescence.
- (11.) Influence of natural and other conditions on construction costs of major logging improvements, such as tramways, &c.
- (12.) The formation and observation of experimental logging-areas under various systems of extraction and silvicultural treatment.
- (13.) The location and observation of demonstration forests.
- (14.) Location, observation, and record of sample forest areas for statistical purposes.
- (15.) Forest mensuration, management, and forestation.
- (16.) Quantitative and qualitative forest increments in mature forests and on cut-over lands.
- (17.) Standardization of silvicultural practice.
- (18.) Correlation of biological factors with physical, chemical, and structural qualities of timber.
- (19.) Effects of forests climatically on various parts of New Zealand.

The Forest Products Laboratory.

The purpose of the Forest Products Laboratory is to promote the most profitable and economical utilization of forest products for the benefit of timber operators and users of wood, and to aid in the administration of the forests. In dealing with wood problems, preference, of course, should be given to those investigations relating directly to improved utilization and current business on the State forests.

The laboratory should be concerned with the conduction of technical studies and experiments designed primarily to add to existing technical knowledge of the properties and constituents of wood, and to develop by commercial tests new processes or methods of utilization having economic value, such as—

- (a.) Market studies.
- (b.) Market prejudices against certain grades and species.
- (c.) General questions of timber supply and demand.
- (d.) Industrial investigations such as—(1) Collection and compilation of statistics of production and consumption of forest products; prevailing market and stumpage prices; imports and exports; freight rates: (2) use and demand and prices of our exported timbers in other countries: (3) compilation and study of specific specifications of rough and manufactured forest products: (4) studies of lumber-manufacturing and wood-using industries as to methods, forms of material, wastes, costs, equipment, substitution of one species for another, and the improvements of more conservative use of raw material: (5) advice and assistance, through co-operative agreements and otherwise, to other Government Departments, counties, industries, and individuals.

Among the many problems of prime importance that the Forest Products Laboratory should be concerned with in the next few years are—

- (1.) Investigation and study of the relative pulping-values of our native woods. There are many thousands of tons of waste wood accumulating as a consequence of exploitation that might be utilized for the manufacture of wood-pulp, paper, and composition-board. The solving of this problem would be of great practical value to the paper-consumers of New Zealand. Every effort should be made to establish the pulp and paper industry in New Zealand. (A pulp and paper mill uses its raw material to a much finer degree than does any other wood-using industry.)
- (2.) The possibilities of securing a cheap motor-fuel by distillation of waste wood. The high price of petrol, together with early exhaustion of the big oilfields, will soon make possible the development of the wood-distillation industry having for its main objective the production of alcohol. This problem is now being aggressively investigated in the United States, and it is hoped in a very short time that an economical method may be worked to utilize at the mill the waste in all the great timber-producing centres for this purpose.

- (3.) The development of new-type butter-boxes in which other timbers of low value are substituted for the high-priced and elusive white-pine.
- (4.) Investigation of the New Zealand beeches as to their best use as containers for tallow, hides, sausage-casing, &c.
- (5.) Investigation into the broad field of new uses for wood, and its application. It is only by the development of ready markets that we can hope to utilize the vast amount of wood which is at present thrown aside in the manufacture of timber.
- (6.) Investigation into the possibilities of built-up timber. For instance, the Southern Pacific Railway Company are at the present time testing a built-up railway-sleeper in Nevada. This sleeper only uses 10 per cent. of the wood volume of the solid sleeper, and it also saves 15 per cent. in the number per mile. This sleeper is preserved before use. In its construction short lengths and widths are used, and the whole is bound together with 1 in. wood dowels. There are many other outlets for inferior qualities of timber, and it should be the duty of the Forest Products Laboratory to thoroughly investigate the value of the low grades.
- (7.) At the present time there is a great lack of definite technical knowledge as to the mechanical and technical values of wood in New Zealand. One of the first problems should be to make a thorough study of each timber-species as to identification, mechanical properties, physical and chemical characteristics and properties.
- (8.) Air seasoning and artificial drying.
- (9.) Agencies destructive to wood.
- (10.) Wood-preservation.
- (11.) The possibilities of gum-bleeding; extraction of kauri-gum in swamps, &c.

The advice of the writer is that this Service in its forest research should co-ordinate its work with that of investigators in other parts of the Empire—such as Canada, British Columbia, Australia, India, South Africa, and Great Britain—and with that of other countries—such as Sweden, France, Germany, Italy, United States, Philippines, Malay States, Japan, Hawaii—and of those countries in South America that are carrying on forest research.

In conclusion, it is suggested that wherever it is possible to co-operate in this research work with the Lands Department, Department of Agriculture (Biological Section), or Department of Public Works, steps to secure such co-operation should immediately be taken.

NOTE.—The existence of a Forest Products Laboratory in the execution of a modern forest policy is a very important and essential one in countries such as Canada, India, Australia, United States of America, and New Zealand, where means of fully utilizing the rapidly diminishing supply of timber must be secured. India, five years ago, established a Forest Products Laboratory with a commencing appropriation of £70,000; to-day the Indian Government is spending £400,000 in expanding its field of influence. Western Australia recently appropriated £500 to assist in the erection of a laboratory at Perth University. Canada has a well-equipped laboratory which has justified its existence; while the Forest Products Laboratory of the United States has attained international fame through its good work. This institution has saved millions of dollars to the manufactories of that country. In British Columbia a Forest Products Laboratory has been established in co-operation with the University of British Columbia. During the war much valuable work was done in timber-testing and aeroplane-stock investigations.

INVENTORY AND CLASSIFICATION OF THE FOREST RESOURCES, FOREST LANDS, AND SOILS OF NEW ZEALAND.

An outstanding and immediate need at this stage in the development of a Dominion forest policy is for *exact information as to the present forest and timber situation*, so that fact may replace opinion and the exact truth may be known. Assuring progress towards a solution of the forest problem cannot well be expected until the starting-point itself shall have been determined. Present information is fragmentary, widely scattered, and theoretical. There must be a definite assembly of the facts appertaining to—

- (1.) The past, present, and future consumption of wood by the nation in all its localities and by all its industries.
- (2.) The extent and value of the indigenous forests.
- (3.) The protection and climatic values of forest areas in all districts.
- (4.) The means of meeting future demands.
- (5.) Rate of growth (accumulation of new wood-fibre), and the value between growth and consumption..

Your investigator advises that provision be made and funds provided by the legislative body for a definite and thorough-going stock-taking of the forest resources, forest lands, and forest soils of the Dominion by this Forest Service in co-operation with other interested Government services. The following information to be collected:—

- (1.) Reliable statistics as to the past, present, and probable future wood needs of all industries and communities.
- (2.) Distribution, accessibility, and extent of all the standing forests and forest lands on Crown, Native, and private areas.
- (3.) The general rate of growth of all species.
- (4.) General means of natural and artificial regeneration.
- (5.) The forest-fire protection standards for each region.
- (6.) A general classification on modern standards of the forest soils—their relative suitability for forestation or for agriculture, extent and area.
- (7.) The relative value of all forest lands for (a) national and local supply, (b) public safety, (c) public health.

This volumetric and economic analysis will enable your Forest Service to definitely recommend the basic requirements for a permanent forest policy in—

- (1.) The necessary addition to the State forests to be placed for submission to forest management.
- (2.) Definite measures to ensure regeneration of the native species.
- (3.) The necessity or otherwise for increased exotic-tree planting by the State and individuals.
- (4.) The national and local protection measures.
- (5.) Degree of control and regulation over the forest industry.
- (6.) The relative areas of agricultural land available in State forests.

CLASSIFICATION OF AGRICULTURAL AND NON-AGRICULTURAL LANDS IN STATE FORESTS, FOREST LANDS OF THE CROWN, ETC.

The Forest Service should begin without delay an examination of all State forests and provisional State forests, forest lands of the Natives, and other Crown lands carrying forests, with a view to ascertaining the location and extent of lands which are chiefly valuable for agriculture, and which could be occupied for agricultural purposes without injury to the State forests of the country, and which are not needed for public purposes, to the end that they may be listed with the Department of Lands for opening to settlement.

The principle that should be emphasized here is that all forest lands under the control of the State should pass first through the hands of the Forest Service, so that a scientific examination may be made by the competent soil specialists of this Department as to whether the land is agricultural or non-agricultural—for in these days when the maximum production is so necessary to the life of the State the great thing is to keep all land steadily at work, and those areas which can best produce forest crops should be kept at work growing timber, while lands which can best produce farm crops should be kept producing such crops.

During the past, and even now, the writer is informed, about 30,000 acres per year of land reverts to scrub and useless waste. At this time every effort should be made to work this problem out to the best advantage of all. A very close co-operative agreement should be entered into by the Forest Service, the Department of Agriculture, and the Department of Lands as to the procedure to be adopted. Every acre of available agricultural land should be earmarked for use; and the writer is confident that if this problem be attacked in a practical, efficient, and workmanlike manner it should be possible in two or three years to classify every acre of agricultural ground within the State forests and forests lands of the Crown.

To ensure the efficient administration, protection, improvement, and use of the State forests and their resources, however, certain lands, whether agricultural or non-agricultural, must be retained in public ownership. These include areas for forest administrative stations, pastures, planting and nursery sites, and for similar purposes needed in the work of Government officials charged with the administration, improvement, and protection of the forests. They include also public-service sites which embrace all areas needed for the proper utilization of State-forest resources, such as camping-grounds, springs, mill-sites, logging-roads, stock-driveways, holding-grounds, likewise tracts embracing watersheds from which the water-supply of municipalities is taken.

The following lands, for instance, should be retained for the public :—

- (1.) Lands which protect stream-flow, or check erosion on the watershed of any stream, important to irrigation, water-power, or to the water-supply of any municipality or open lands, unless their permanent value under cultivation is greater than their value as a protective forest.
- (2.) Lands more valuable for the production of trees than for agricultural crops, and lands densely stocked with young trees having a prospective value greater than the value of the land for agricultural purposes.
- (3.) Lands above timber-line, or in small stands scattered through the forests, making elimination impracticable.
- (4.) Lands not either wholly or in part covered with timber or undergrowth upon which it is expected to grow trees.

FOREST LANDS OF THE NATIVES.

In the wider public interest of the Dominion the writer suggests *a new method of treatment with reference to these lands*. The present system has not always been in the immediate or ultimate interest of the public or the Native owners, for it has opened the way to some extent to flagrant trafficking and speculation. Your adviser submits a new method of management which will result in the greatest good to the Native owners, ensure the greatest economic productivity of the land, and ensure to the wood-consuming public a considerable proportion of this timber-supply in perpetuity. It is as follows: After the completion of the stock-taking of the forest resources and land-classification of the Native blocks, the agricultural lands therein should be definitely earmarked for disposition for settlement purposes, and the standing timber thereon earmarked for alienation, after careful appraisal and valuation in the Forest Service. The non-agricultural areas, or lands better suited for silviculture than for agriculture, should be then definitely dedicated to forest management under the control and administration of the Forest Service (in trust for the owners): all profits accruing from such administration to be handed over to the Native owners.

This proposal ensures—(1) Continuous and sustained revenue to the Native owners in perpetuity; (2) a sustained timber-yield and a high state of productivity; (3) the best use of the land; (4) it eliminates the future and possible problem of landless Natives; (5) it provides suitable, agreeable, permanent, and remunerative employment, and opportunities for Native settlement.

THE FOREST INDUSTRY OF NEW ZEALAND.

It is in the public interest that the timber industry in New Zealand be placed on a permanently stable and prosperous basis, for its secure and steady operation is of vital concern to the public. An abrupt reduction of the *per capita* consumption of timber below the current rate (about 300 ft.) would seriously curtail the economic development of this young country, which is just now on the threshold of a great era of expansion. Moreover, the future needs must be secured within New Zealand, for timber-importation will not be possible in a very few years, except at excessive famine prices. There must be an equal sympathetic and helpful attitude towards the milling industry in every contact with it by the public and by all governmental agencies of whatever character, if the public is to expect earnest, wise, and successful effort in the industry to perpetuate itself. The timber-producing industry, the public, and the Government service can work out a relation in which the interests of all are protected, and a thorough understanding replaces hostility, antagonism, and distrust.

As an earnest of the desire of the Government to inaugurate a better condition, the following expresses in part how many of the disabilities under which the timber industry labours could and should be removed by public action: (1) A progressive and businesslike method of marketing public timber with a view to stabilization of prices of forest products; (2) a well-ordered system of forest administration; (3) a progressive transportation policy; (4) equitable taxation; (5) a definite and stable export and import policy; (6) diffusion of knowledge among the consuming public as to production and consumption of timber, and the proper value and usefulness of various qualities and kinds of timber; (7) assistance to the industry in matters of research and investigation, &c.; (8) establishment of training courses in logging and milling engineering.

The milling industry, on the other hand, if a better condition is to be secured, must consider the following problems and their solution. How to—

- (1.) Satisfy the legitimate and reasonable timber needs of New Zealand at reasonable prices.
- (2.) Secure the highest reasonable efficiency in exploitation and manufacture by maintaining a high standard of technique in woods and mill.*
- (3.) Develop a system of marketing and distribution by which every community receives its wood needs.
- (4.) Co-operate in the protection of forest areas against fire.
- (5.) Maintain a decent standard of housing and working-conditions for labour.†
- (6.) Co-operate with the Forest Service in the working-out of the problems of forestation.

The writer recommends that the Forest Service be authorized to carry out a complete and exhaustive investigation into the economic position of the forest industry and its relation to the public and to the public forests, in order that it may be in a position to deal justly and equitably in the promulgation of standards, rules, and regulations. In this study the following phases should be covered:—

- (1.) Development, past and present.
- (2.) Organization and federation.
- (3.) Concentration of control and ownership of timber land.
- (4.) Relation of the various forest manufacturing centres to domestic and export business.
- (5.) Prices, past and present, and future trend.
- (6.) Labour problems.
- (7.) Incidence of taxation.
- (8.) Distribution, marketing, and sale of products.
- (9.) Standards of manufacture and milling economy.
- (10.) Burden of royalties and other public charges and their relation to selling-prices.
- (11.) Probable influence of silvicultural regulations in adding to the cost of forest products to the consumer.
- (12.) Probable future of the industry.
- (13.) Credit facilities and financing procedure.
- (14.) Manufacturing-costs.
- (15.) Constructive improvements possible.
- (16.) Visible commercial supplies of timber in each district.
- (17.) Speculation and trafficking in timber lands.

* It was with a great deal of pleasure that the writer inspected the operations of a Southland mill. This highly efficient plant has developed a very diverse market for its products, viz.: Pack-saddle elements from short lengths; packing-cases, boxes, and crates from low grades; mine-sleepers, legging caps and sills, all from low-grade inferior side cuts; fence-droppers, stakes, from slabs; car and coach sills, interior coach finish; agricultural-implement bars, and furniture stock; broom-handle bars, cheese-crate heading; battens, siding, lining, and flooring, and other general building-material; cask timber for staves; brush-backs; logs and railway-sleepers.

† The present system of migratory milling (the average life of a sawmill operation in New Zealand is seven years) does not give the forest worker stability of employment and a "chance at home." Housing and sanitation are often outrageous, and living-conditions intolerable. Under these conditions the timber-worker easily becomes voteless, landless, womanless, homeless, restless, discontented, and radical. To a large extent this problem may be solved by the development of the central-milling idea, which will permit of a more adequate and efficient operation, ensure suitable and livable working-conditions, reasonable educational facilities, and stabilization of definite communal centre.

On the completion of this intensive investigation it will then be possible for the Forest Service, in co-operation with the industry and the public, to indicate to the legislative body, for incorporation into law, those desirable standards, principles of control, and regulations, such as—

- (a.) Reports as to returns and costs of production and consumption; accounting systems; direct and indirect gains under regulation logging; dependable forest statistics.
- (b.) Control of timber-production in times of economic stress.
- (c.) Creation of machinery for the interchange of views and all fundamental differences.
- (d.) Public control to prevent forest-devastation and ensure continuous production of forest crops on lands which would otherwise be idle (where such might be necessary to establish forest industry on a permanent basis in harmony with public interest).

STATE-FOREST EXTENSION

There are, broadly speaking, four classes of forest in any country: these are—(1) National-supply forests; (2) protection forests; (3) national parks, monuments, and recreational areas; (4) local-supply forests. Items (1), (2), and (3) are of general interest to the nation: all industries and all citizens benefit. Item (4) is of only local value, for it affects only that particular district in which it is situated.

Apparently State-forest extension in the Rotorua district and in the South Island has been carried on with a view to supplying chiefly national and not local needs, and it was intended that from these planted areas should be provided the timber needs of the future.

It is manifestly *impossible* at the present rate of planting, or at that rate which has prevailed in the past, to satisfy by planting even the minimum needs of the North Island. Millions of money would be needed to establish the necessary area of artificial forest, and before many years had passed the taxpayer would have found that he was saddled with a national obligation such as exists to-day under the war debt. It is indeed very fortunate that the public have become tired of this system of ensuring future timber-supplies, for it is doomed to failure at the present stage of New Zealand's development, for the merchantable timber produced under this scheme at a high cost of production could not possibly compete with supplies imported from countries where virgin areas were being exploited. The writer therefore suggests *that the major part of our interests and investments be concentrated on the absorption of all indigenous forest areas*, and the placing of these areas under regulated forest management. In this latter case the State is provided with a capital which costs very little in comparison with the artificially established forests.

It is desirable, therefore, that provincial State-forest allocations be accelerated, and extended to the effect of withdrawing all public forest lands from disposal by sale or entry, providing at the same time for reasonable protection, and eventually for a regulative forest management. In the withdrawal of these areas local needs as well as national needs should be considered, as well as the needs of the forest industry and the obligation of protecting the property against destruction and devastation. After every area of actual or potential value has been allocated for forest purposes and the annual volume of increment has been determined, it will then be possible to compute with accuracy the deficiency which could be made up by aggressive planting.

Your investigator suggests that caution should be exercised until *fact* replaces *opinion* and we know exactly what our indigenous forests will produce. This will take a matter of about five years. In the meantime the forest-management activities of this Service should be confined to—

- (1.) Demarcation and formation of preliminary working-plans of all the national-supply forests.
- (2.) Development of managerial plans for the protection of forests and for national parks, &c.
- (3.) Development of an aggressive campaign for the extension of semi-public and private planting by public institutions endowed with forest lands, by county bodies, municipalities, industrial corporations, and private individuals. It should be to these agencies that the various communities should look to supply them with their purely local needs.

State Plantations.

With regard to State plantations, it is suggested that the following activities be carried on by this Service during the first quinquennial period:—

- (1.) Reorganization of the tree-planting division of the Service and the formation of a well-paid personnel.
- (2.) Preparation of definite plans of management for each forest unit, with construction of efficient fire-protection plans.
- (3.) Consolidation of certain forests to a maintenance basis.
- (4.) Planting concentration in certain definite areas where the industrial needs of wood-consuming industries must be met with timber-supplies.

The following is proposed in this connection:—

- (a.) Plantations to be placed on a maintenance basis: Puhipuhi, Whakarewarewa, Conical Hills, Dusky Hills, Pukerau, Gimmerburn, Waitahuna, Dungle, Gallo-way, Omarama, Raincliff, Te Kapo.
- (b.) Plantation forests to be consolidated and completely rounded out during the next five to seven years: Waiotapu, Kaingaroa Plains, Kaingaroa Plains West, Green-vale, Naseby, Balmoral.

- (c.) Planting operations to be carried on indefinitely for the next generation: By direct action—Hammer Springs, Blue Mountains; by co-operative agreement—Sand-dune planting, &c.
- (d.) Acquisition of freehold cut-over areas where a potential and immature forest growth is existent: Auckland District; inland empire, North Island; and generally throughout New Zealand.

A special note at this time should be made of the relations of the Government to the Selwyn Plantation reserves. These reserves, which are located in the Canterbury District, extend over 15,000 acres, and contain several thousand acres of forest plantations. Under definite regulations the administration of these reserves is vested in a Board, the Chairman of which is the Commissioner of the Canterbury Land District. There is also a regulation to the effect that the Superintendent Nurseryman of the South Island will supervise operations (this responsibility has not been exercised for the last two or three years). Your investigator strongly recommends that under the new organization the District Executive of the Forest Service be appointed definitely as Chairman of the Board governing this work. There is everything to be said in favour of having a trained forester as the responsible representative of the Government in a matter of this kind.

NOTE.—The financial aspects of forest-extension are discussed under the heading of "Forest Finance."

EXTENSION OF FORESTS BY EFFORT OTHER THAN BY THE STATE.

To accomplish the main objective of forestry requires joint action on the part of the State and of the individual. Therefore it behoves the regulative body to make it possible for the citizen to engage in the business of forestry by guaranteeing that the conditions under which he works are at least equal to the advantages enjoyed by the Forest Service in the production of wood crops and the manufacture of forest products. There must be removed—(1) The uncertainty of legislation; (2) the instability of State and county taxation; (3) danger of loss by fire; (4) insufficient means of access and transportation; (5) the fear that the investment in the long-time business of forestry may prove disastrous or unprofitable. It is within the power of the New Zealand Government to stabilize and satisfy all these conditions.

Your investigator submits the following methods of solution:—

Solution of Item (1).—The uncertainty of legislation can be neutralized by the declaration of a definite forest policy—the creation of an administrative body (Forest Service); the enactment of a fundamental but comprehensive forest law, and the creation of legislative machinery to enable the development of effective co-operative procedure, and the expansion of such powers as the growing of trees at State nurseries, for the sale and distribution of same at cost (or less than cost if expedient); the authority to give technical and expert advice and supervision to private owners; the formation of forest working-plans; the establishment of demonstration woodlots; and the power to enter into proceeds-sharing schemes with private owners or local bodies.

Solution of Item (2) (the instability of State and county taxation).—It is recommended by your adviser that a thorough and exhaustive investigation be made as soon as possible by the Forest Service into the incidence and burden of taxation on forests and forest lands, and that a uniform system of State-forest taxation be adopted by legislation, a system which will ensure the best use of the land and will be uniformly applied throughout the Dominion. The taxation measure should adopt the principle of a *deferred-yield tax* on the growing forest stand, and, if expedient, a *surtax on forest lands not protected or managed* in accord with sound forestry principles as expressed in the regulations and standards set by the State Forest Service.

An equitable forest-taxation law as has been suggested should overcome those serious objections so often expressed by private owners—i.e., that present taxation impositions are so heavy, unjust, and so out of proportion to the incidence of public burdens on other forms of property, that private forestry is impossible. A measure of this kind should go a long way to making possible the successive growing of trees and the practice of conservative exploitation by earnest and public-spirited citizens and companies.

Solution of Item (3) (danger of loss by fire).—The fire hazard is without a doubt a great drawback to the practice of forestry by the private operator (as it may be to the State) who wishes to grow timber or introduce conservative cutting on his holdings. The responsibility of overcoming this serious menace is entirely in the hands of the State. The forest-protection problem might therefore be made the subject of a mandatory fire-protection law. In essence this law would cover the following aspects: Any region may be declared a fire-protection district, in which district by a system of co-operation the Forest Service would take charge of all forest-fire prevention and control. The Forest Service may for each district promulgate rules and fix standards to minimize the hazards and induce an efficient participation by all forest-owners and others in the protection of the districts, forests, and woodlands. The Forest Service may provide appropriate penalties for the enforcement of the fire-prevention standards for each district.

At such times as the operation of the fire-protection law results in efficient prevention and control of the fire hazards, *fire insurance* comes within the range of feasibility. Every encouragement should then be given to the adoption of plans of insurance such as has been inaugurated by the State Fire Insurance Office. A national extension of this insurance should be put into effect as soon as the regional protection plans have been worked out. The writer is convinced a premium may be worked out that should not be more than one-half of 1 per cent., and possibly much less.

Solution of Item (4) (insufficient means of access and transportation).—The successful operation of private forestry operators is dependent on ready and accessible markets for the preliminary,

intermediate, and definitive forest products resulting from conservative exploitation or silvicultural management. Ready markets can only be reached when adequate and economical means of transportation are available, therefore the writer urges that, in all cases where considerable individual participation in the practice of forestry or in tree-planting is possible, the Government should assume the responsibility of guaranteeing reasonable facilities for transport wherever it is in the public interest. This may mean road-formation from the property to markets or common carriers, or it may mean the extension of railway sidings, accommodation, or spurs. In all cases, however, the Forest Service should be asked to investigate and advise as to the economic advantages of public action in extended assistance.

Solution of Item (5) (the fear that the investment in the long-time business of forestry may prove disastrous or unprofitable).—*By State financial assistance for private forestry and forest exploitation.*

An important element to private forestry is the cycle between "seed" and "sawdust," as the investment may be locked up for at least a generation, but the State as a perpetual authority interested in the national well-being over many generations can with great advantage to itself engage in forest management. Therefore a system of partnership between owners and the State, by which the proprietor furnishes the land, labour, and maintenance, and the State advances cheap money and supervision, should successfully remove one of the chief obstacles to private tree-growing.

In furtherance of this principle of the State advancing financial assistance the writer advocates the establishment of a State Forest Loan Fund organized to advance funds for assistance in private growing of trees, and for the purchase and improvement of forest lands on which owners might wish to practise sound and practical forestry.

The State Forest Loan Fund should also be available for the advancing of capital on partnership or other terms to the forest industry of New Zealand. [Precedents: (1) Principle in "Loans for Public Works in Mining Districts," Local Bodies' Loans Act (Consolidated Statutes, 1908); (2) Act No. 8 of 1909, "An Act to make further Provision for the Closer Settlement of Land," &c.; (3) Act No. 41 of 1919, "An Act to authorize the Making of Advances for the Promotion of the Fishing Industry."] The forest industry is to a large extent organized in small units, and is in particular need of the development of credit facilities. The Government of New Zealand is responsible to a large extent for this instability, for by its system of disposing of public timber the large, efficient installation has been discouraged. If the forest industry had the advantage of Dominion assistance in the organization of credits, cheaper capital would be made available to assist both in forest production and in more efficient utilization of existing forests. High interest-rates, due to unorganized small borrowing, result in wasteful manufacture.

The Forest Commission of Great Britain have adopted this policy of State financial assistance by loans on a long-time basis to forest growers and exploiters, and the United States of America is seriously considering its adoption. In New Zealand the principle has long been in force with reference to agricultural development, and now applies to the fishing industry.

The proposal is sound, in the public interest, and under a careful, businesslike administration should—

- (1.) Create an important private participation in tree-growing on a sustained-yield basis;
- (2.) Assist the forest industry by providing money at a low rate of interest for the establishment of a local forest industry and improving the economy of manufacture;
- (3.) Stabilize forest industry and ensure the development of outlying districts;
- (4.) Tend to reduce the price of forest products;
- (5.) Stimulate high economy in manufacture;
- (6.) Encourage the small operator, and thus permit of a close supervision and control in the interest of the conservation of forest supplies, &c.

The writer suggests the establishment of a Forest Loan Fund of £100,000, to be administered by the Forest Service, on the advice of the Consultative Forest Board, along the lines which have been briefly exposed.

FOREST-PROTECTION PROBLEMS.

Protection of the Forest from Fire.

Inadequate fire protection may nullify all attempts at such forest management as the regulation of cutting to ensure a second crop of timber and the planting of denuded areas.

Generally speaking, the *forest-fire problem in New Zealand is a serious one*, and without its solution by this Service no stability can be secured. Constant use of fire in the daily life of the people and in the industries, sparseness of population, relative inaccessibility of timber—all tend to expose to fire damage the forest resources of the country.

Forest-fire plans must be developed along the lines of modern fire-prevention, so that the liability may be lessened, the fire hazard reduced, the cause and difficulty of discovery and control minimized, and so that promptness and efficiency in actual fire-fighting may be secured. The fire plan involves a systematic study of the conditions in each forest area and in each forest, and it must be remembered that it is impossible to prepare one standard plan which will meet the local conditions of all forests. Complete information is a pre-requisite to the formulation of fire-control measures, so it will be seen that early action is necessary along this line by the Forest Service.

One particular detail that must be worked out is the liability of the Department of Railways as to fires originating from their right of way. Apparently their liability is a negligible one. This, however, must be overcome, for perhaps the greatest enemy to the forest is the locomotive unequipped with spark-arresters.

Another point in connection with fire protection is the vital necessity of easy communication: the forest subject must be opened up by auto-roads, pack-trails, telephone-lines, &c.

Protection of Forest from Insect-damage.

An early co-operative agreement should be entered into with the Department of Agriculture to conduct in co-operation with this Service all entomological investigations. Their advice as to control should be obtained, and in the case of control operations this Service should look to them for assistance in effectively controlling the pests.

It is hoped that the Director of the Biological Section of the Department of Agriculture will be able to detail an officer at an early date to make a comprehensive examination of all the State plantations, so that we may be forerhanded in dealing with such trouble as the introduction of exotic trees may bring us.

Protection of Water-supply.

The greatest indirect value of the State forests lies in their influence upon the regularity of water-supply. In many districts of the country from the forest areas is drawn the only water-supply for the development of power, for irrigation, and for domestic and industrial use. The future development, for instance, of the great irrigable areas of Central Otago is dependent upon the amount of water and the manner in which it flows from the Southern Alps. The same may be said of all those regions that border or are contiguous to the Southern Alps. It has been proven that the vegetative covering has a very decided influence on run-off, and probably a slight influence on precipitation. It is necessary, therefore, that this Service follow a definite consistent policy with reference to the restriction of the use of forest resources for the purpose of protecting the water-supply. Complete information must be collected as to the sources, the amount and use of water arising in the public forest, and an investigation as to the special measures necessary to maintain the protective value of the cover. This water-protection plan for the Dominion will show all those watersheds that supply water for municipal and domestic use, for irrigation, and for the development of hydro-electric power. It will show also flumes, dams, fire plants, streams, disastrous floods, and settlements, mines, and railways in need of protection from snow-slides, &c. The economic value of our forests from a climatic and protective standpoint cannot be too highly emphasized. It is particularly vital, for instance, that a continuous protective forest be established on the Tararua, Ruahine, and Kaimanawa Ranges, Taupo District, and through the Huiarau Range, Ruakumara Range, and all along the eastern and western side of the Southern Alps.

Protection of the Public Health.

Every precaution must be taken by the forest officers to protect the public health, and all persons on State-forest lands should be subject to trespass proceedings if insanitary conditions result from their presence. For instance, this regulation might be enforced: "It is prohibited to have or leave in an exposed or insanitary condition on public forest lands camp refuse or debris of any description, or to deposit on the public forest lands, or being or going thereon and depositing in the streams, lakes, or other waters within or bordering upon the public forests, any substance or substances which pollute or are liable to cause pollution of the said streams, lakes, or waters."

Fish, Bird, and Game Protection.

It is recommended that this Forest Service be charged with the protection of the native and imported fish, birds, and game. It is the logical function of the Forest Service in France, Germany, and to some extent in North America. In the Province of New Brunswick this control is working out splendidly, and there is no reason why it should not do so here. Particularly is it of value here in New Zealand to have charge of such imported animals as deer: unrestricted multiplication of these animals may lead to serious forest damage (as, for instance, is the case in Scotland).

Game is a product of the forest; it adds materially to the enjoyment of the public forests by the public, as well as to their possible economic uses. The preservation of game, animals, birds, and fish, and the elimination of game violations, should be an important duty of forest officers. In every manner encouragement should be given to the development of this aspect; and if it is not thought advisable to hand over the game-protection to the Forest Service a very close co-operative agreement should be entered into with the present competent authority. For instance, every forest officer should be appointed a Ranger under the Native and Imported Game Act.

GRAZING WITHIN STATE FORESTS.

This Service *should have authority to permit, regulate, or prohibit grazing in State forests.* Under its direction the Forest Service should allow use of the forage crop as fully as the proper care and protection of the forests and the water-supply permit. Every effort should be made by forest officers to promote the fullest possible use of the grazing resources, for the utilization of forest grasses and plants reduces the fire danger and helps to protect the forests. All grazing should be under the form of permits on a *per capita* basis, as there are several reasons why the acreage-lease system is undesirable: for instance, it increases the difficulty of proper silvical development, prevents a proper use of the range under abnormal natural conditions, and tends to exclude the smallest owners. The lease gives the lessee some right to dictate the use to which the area will be put, and during the tenure of the lease no part of the tract could be closed to grazing, even though the necessity was urgent to prevent the destruction of seedlings, to secure reproduction on cut-over lands or burnt areas, or to protect important watersheds. The privilege is a fixed instead of a flexible one, and if during the period forage is destroyed by fire, insects, or other cause, the stock have to be removed from the forest instead of being transferred temporarily to another range.

The leasing system amounts to favoured monopoly, and, generally speaking, term leases hamper forest management, and preclude recognition of new applicants who might be entitled to range.

There is everything to be said for the control of the grazing within forest boundaries by the Forest Service, and little against.

SECTION IV.—RECOMMENDATIONS (*continued*).

A FOREST ACT.

A progressive modern forest policy for New Zealand will require for its execution a simple, clear, and effective forest law, for the present laws and regulations in force are archaic, ambiguous, inelastic, and clumsy, and no efficient policy could function successfully under them. Legislative machinery should be provided to permit of a businesslike management of the State's forest resources and diverse timber interests. In framing a new Forest Act—a new orientation must be made—all previous legislation and regulations should be repealed (at least so far as they conflict with a well-ordered administration), and a new forest law established along the following lines.

There are three aspects concerned in formulation: they are—(1) The principles involved and on which the Forest Act should be based; (2) principles of organization; (3) principles determining the effectiveness of the Act and organization.

Aspect No. (1) has been fully discussed in previous pages. In review, the principles to be chiefly considered are—

- (1.) State ownership of forest lands.
- (2.) Dedication to forest management of all State forests and timber lands of the Crown.
- (3.) The national interest in the fullest utilization and protection of its forest resources, whether public or private.
- (4.) Unless and until public lands can be more profitably employed for other purposes they should be used to produce forest crops.
- (5.) The ownership of forests, according to the histories of other and older countries, carries with it an obligation on the part of the State to see that mountains and plains are not laid waste, because forests affect fundamentally the economic welfare of communities and the nation.
- (6.) The participation in tree-growing by local bodies and private owners.
- (7.) The perpetuation of forest industries is of vital concern to the public.
- (8.) The State is entitled to a full and just share of the value of its forest resources, and as owner of the raw material is a copartner in forest industry.
- (9.) Incidence and burden of forest taxation.
- (10.) The administration and management of State parks, scenic reserves, climatic reserves, forest lands of the Native race, hunting, fishing, and game protection and culture is a proper function of a Forest Service.
- (11.) Local legislative bodies are entitled to participation in the net revenues accruing to the State through the management of State forests which may be situated within their areas (in lieu of local taxes which must be foregone through State ownership).

Aspect No. (2) (principles of organization).—This Act should be one which will create one Service of the Government which is empowered and made responsible for—

- (a.) The state of the forest resources of the country; the protection of the public timber from fire, disease, and trespass; the management on the most progressive principles of all timber lands which have already been leased for milling purposes; the sale of such timber as now remains in the hands of the Crown; and the forest development and utilization of the State forests of New Zealand.
- (b.) The Act should also make provision for a consultative Forest Board composed of from ten to fifteen members, representative of all interests directly and indirectly concerned with forestry. This Board should advise the executive directing head of the Forest Service. (This method of making up a versatile advisory body will practically eliminate the risk of hasty or poorly considered action or regulation.)
- (c.) It should provide for a directing head qualified by technical forestry training, applied experience, and executive organizing ability to administer and manage the activities of the Service.
- (d.) It should ensure ample delegation of authority and discretionary power to the Director of the Forest Service. It is impossible at this stage of forest development in New Zealand to indicate those detailed methods of forest administrative procedure and diverse form which should be framed into law. It is a condition of success that "single responsibility of inspiration and unity of direction and control" be aimed at, rather than the loading-down of the Forest Act with ambiguous unworkable clauses, or the pernicious system of dual control so prevalent in bureaucracy. Divided authority, the writer submits, means failure. It is essential that the Director be left to work out gradually—after he has had time and opportunity—the methods of procedure. They can, if necessary, be readily incorporated as part of the Act. Provision should also be made for the Director to delegate, at his discretion, his power to subordinate officers.

- (e.) It should provide for the settlement of difficulties, grievances, controversies over interpretations, enforcement of regulations as prescribed by the Director in pursuance of his authority under the Act. His decision on matters which do not come under the jurisdiction of the Court should be final (always in consultation with the Crown Law Office, &c.).
- (f.) It should provide for the closest co-operation and co-ordination with all other Government Departments.
- (g.) It should provide for the effective safeguards of the Civil Service, with internal authority to recognize and reward merit and efficiency.

Briefly, there is required by law—

- (a.) A forest authority (Forest Service).
- (b.) The formation of a consultative Forest Board.
- (c.) Provision for a directing executive head qualified by technical forest training, applied experience, and executive ability.
- (d.) Provision for delegation of authority and discretionary power to the Director, and by him to his subordinates.
- (e.) Provision for the settlement of grievances, difficulties, &c., by the Director.
- (f.) Provision for close co-operation with all other Government Departments.
- (g.) Provision for the functioning of Civil Service machinery with internal authority to reward merit and efficiency.

Aspect No. (3) (principles determining the effectiveness of the Act and organization).—The effectiveness of the organization (Forest Service) will depend on the provision made in the Act for—(1) Adequate funds for forest-management projects; (2) efficiency of the personnel and force; (3) proper equipment; (4) general diffusion of forest knowledge; (5) sale and disposition of the products of the forest, whether timber land, timber-trees, kauri-gum, or other commodities; (6) control of cutting, classifying, measuring, manufacturing, and exporting; (7) technical education; (8) a Forest Products Laboratory and Division of Research and Investigation; (9) appropriate penalties for the enforcement of the law.

General.

To ensure the successful operation of the Forest Act there must be harmony; and to secure it there must be the fullest co-operation between the Administration (Forest Service) and the public—for in the last analysis it is the public that will decide whether it is a good law or a bad law: their judgment is final.

The forest administrative authority can be counted upon to do its part if there is assured—(1) Clear expression of policy by the legislative authority; (2) the delegation of a straight line of authority to the directing head; (3) consistent support by the legislative authority; (4) recognition of service and merit; (5) adequate development funds.

THE FOREST SERVICE.

What is a Forest Service ?

The general idea prevalent in New Zealand is that the planting of young trees is the chief end of forestry. This may be true of South Africa and Australia, but in New Zealand, where there are large areas of public forest land carrying mature timber which is sought after by private individuals, as well as large areas of devastated forest land covered with young trees (the hope of the future), the Forest Service must be organized on the basis that all that pertains to the management, administration, and protection of timber lands is forestry.

By this concentration of management in one Service economy of organization and efficiency in administration can be secured, whether it is the development of a progressive timber-sale policy, the economic study of forest industry and forest products, the protection of forests from fire or theft, exploration and survey of forest resources, inspection of logging and milling operations, timber measuring and estimation, collection of revenue, classification of timber land, or tree-planting.

There must be no reservation of the Forest Service to State forests, for a forest organization capable of administering the national forests, *which are the hope of the future*, is certainly capable of administering the other public timber lands, *which are the mainstay of the present*.

The Work of the Forest Service.

The first essential, therefore, is a Forest Service equipped with funds and powers to work out a forest policy. It will be the duty of this Service to work out a businesslike administration that ensures a conservative and wise use of the Dominion's timber resources, and aids in the continued prosperity of the agricultural, timber, mining, and manufacturing interests of the country. The work, therefore, of the Forest Service should consist in the administration and protection of the Dominion's forests, the development and utilization of their resources, forest-extension on State and private lands, research into technical problems in connection with forestry, and the discovery and diffusion of knowledge concerning the best use of forests and forest products.

The Creation and Retention of an Efficient Service.

The men employed in the Forest Service should be alert, active on every occasion on which promptitude is demanded, of sound judgment, and with a high sense of duty. After all, in such

affairs personal element is an important factor, and, while there may be sound conservation laws and regulations, unless an active machinery is provided for the enforcement of these laws and regulations all efforts to carry out a sound policy may be fruitless.

Remuneration of Staff.

The business of the Forest Service cannot be conducted with efficiency and economy unless there be attracted to, and retained in, the Public Service a group of highly trained, well-paid, and permanent officers of supervisory grades. Uncertainty of tenure in some instances, and inadequacy of compensation, have closed the Public Service to many men of the best type, or forced them out of Government employ at the moment of their greatest usefulness. If a permanent Forest Service is aimed at which will include men of great ability and high attainments, and thus prevent mistakes and failures, a broad attitude must be adopted to obtain and hold employees of the character so imperatively needed in the interests of economy, efficiency, and safety.

This Service will require the services of highly trained experts, many of whom are sought by industrial enterprises, and if insufficient limitations are placed on the compensation of these men the Service will not be able to hold them. In this connection it might be well to point out that this Forest Service, if organized on the lines suggested, should have in its jurisdiction the Dominion forests, valued at between £10,000,000 and £15,000,000. The administration and management of this large asset in its many varied activities require men of highest calibre, and your investigator cannot too strongly emphasize the need of regarding the salary question in a broad light, irrespective of other poorly paid Government Departments of this country.

The Responsibilities, Duties, and Authority of the Forest Service.

In the development of a Forest Service the writer earnestly suggests an adherence to the principle of a *unified line of responsibility*—that is, one in which a clear chain of administration may be secured from the Director through to the forest guard. Undivided control and action tend to increase the efficiency of each officer, and make for economy and directness in dealing with the public, since all business relating to forest administration is transacted by one and the same officer. Moreover, authority is centred, and there is never any conflict, strife, or jealousy arising between men belonging to the same Department.

This system, which naturally develops men of all-round ability and experience, and affords much greater opportunities than one founded on the "specialist" plan, is indeed a very important factor in attracting and holding good men in the Service.

Personnel.

The staff employed in the Forest Service should be technical experts in forestry and other related lines of work—executive officers in charge of forest-conservation regions and forests, clerical assistants, and labourers. Those who hold appointments, besides having suitable knowledge and experience, are required to be honest, industrious, sober, and courteous. Efficiency is the primary quality upon which the advancement of each individual should depend.

The Forest Service the Steward of the People.—This Service should be in a very real sense the steward of the people and the servant of the people in the protection and use of the people's own property. By a frank and direct method of procedure through its bulletins, addresses, and by personal intercourse, this Department should do all in its power to inform the people of New Zealand about their own property which it administers in trust. Co-operation with the timber industry is one of the main elements in forestry progress, and this Service must make a special effort to obtain, in its own and in the common interest, the co-operation of timbermen and other forest-users in its work.

Central Office at Wellington.—The writer has provided for a central executive office in Wellington, at which point would be situated (under plan No. 1) the Director, the Secretary and his secretariat, the meeting-place of the Consultative Forest Board, the Chief Inspector, and the necessary directional and investigative staff. Later in the development of the organization an Inspector-General should be appointed to assume the execution of all activities under the Director, and to act as Deputy Director if need be. The work of this officer would be to directly correlate and co-ordinate the work of the Service, and also to maintain a high standard of efficiency throughout the organization.

From this office should be directed the activities of the Forest Products Laboratory; Forest Experiment Stations; all special and technical investigations; and the managerial duties of the seven conservation regions into which New Zealand has been divided.

Unit of Management.—For the formative period the unit of management for purposes of forest administration should be the *forest conservation region*, for it must be seen that varying conditions make permanent rules by the central authority wholly impracticable; and it should always be the policy of the Director to decentralize the work as soon as the local officer can carry the burden of management.

The Conservator of Forests.—Owing to the lack of men well qualified by education, experience, and ability, only very large districts can be established at first. As trained men become available, and as the business of these districts increases, the larger districts may be subdivided. The officer in charge of each conservation region, which should be considered as the unit for the present, should be known as the Conservator of Forests, and be entirely responsible for the conduct of all the work in his area, and he should be expected to make himself familiar with all forest and related activities therein, and with the work of each of his subordinates.

Forest Assistants.—From time to time forest officers with qualified technical training and experience, known as Forest Assistants, may be temporarily or permanently detailed to a forest

conservation region, to work under the direction of the Conservator on such technical problems as demarcation, timber reconnaissance, appraisal, timber-sale procedure, classification, &c., until the local officer becomes qualified.

Forest Wardens.—As demarcation proceeds, and the preliminary working-plans for forests in the various districts crystallize, administrative forest units should be established in each region. This administrative unit should be known as a *Dominion forest*, and as such would be in charge (as technical officers become available) of a Forest Warden, who should be solely responsible for the administration and management of his forest unit, and for the protection and improvement of it.

Forest Rangers.—The routine work involved in each conservation region, such as inspection of logging operations, examination of lands, fire protection, timber-sale work, improvement plans, and general reports, &c., should be performed by Rangers. The number of Ranger districts in each conservation should be determined by the Conservator with the approval of the Director, and to each of these districts should be assigned a District Ranger. As far as possible the Conservator should have his headquarters in the business centre of the region, as also the Forest Warden and the Ranger.

Forest Guards.—When the work becomes too heavy or complex for the District Ranger, and yet does not make it advisable to provide for the creation of a new district, forest guards should be appointed, to work under the direction of the Ranger. Work of a non-technical character which cannot be performed by the regular force should be performed by temporary appointees. These people should be employed only for a particular purpose, and should be directly responsible to the officer directing their work.

Clerical Staff.—It is impossible at present to foresee just what clerical staff should be necessary, for though labour may be economized by short-cuts, yet it will be largely increased in other directions by the necessity of helping the men in the field, by keeping systematic records of many matters which have hitherto received no attention, and by supplying prompt information both to these men and the public.

Plans of Organization.

A well-manned specialized Forest Service must be brought into being, a Department which would not only be executive and administrative, but also investigative, for when the legislative authority has once passed on the national forest policy the settlement of difficulties and the making of decisions should be made in an atmosphere in which forest policy and not political expediency is the deciding factor.

The writer submits herein in concrete form outlines for a permanent forest authority. This has been done in such a way as to secure the maximum efficiency.

The Direction.—There are three possible methods:—

PLAN NO. 1.

This is the plan that has proved most successful in such countries as France, Germany, Canada, the Province of Quebec, Ontario, British Columbia, and the United States. This form is also the one recommended in part by Sir William Schlich, K.C.I.E., F.R.S., M.A., for New Zealand. It consists of—

Minister in Charge of Forest Service and general policy.

Director of Forest Service (technically trained forest engineer)—in complete charge of the administrative instrument, the Forest Service.

Consultative Forest Board (composed of from ten to fifteen members)—to discuss and advise the Director on matters of national and local interest in forestry (to be strictly advisory and honorary).

Secretary of Forest Service—to be associated with the Director, and solely responsible to him for records, fiscal matters such as revenue, expenditure, collection of royalty, supervision of district accounts, and office administration.

General staff and organization—to function directly under the control and supervision of the general executive head, the Director.

PLAN NO. 2.

A Forest Commission to control and administer the execution of the forest policy, manage all State forests, &c., and to function as the competent forest authority. This Commission idea is working successfully in Great Britain, New Brunswick, several States of the United States of America, in Australia, &c.

In the case of New Zealand the Commission might be composed of the Minister of Forestry; the Director of Forestry; the Secretary; a representative of the forest industry, the consumer, and forest labour—six in all. (The last three members would, of course, be honorary.) Under this system the general executive officer (the Director) would be in charge of all operations as before, and the Secretary would also function as in plan No. 1.

PLAN NO. 3.

Minister in Charge of Forestry and general policy. An executive officer of approved administrative and financial ability to be in complete control; to have associated with him an Advisory Board of experts on forestry and matters appertaining thereto—the Board to consist of not less than four members.

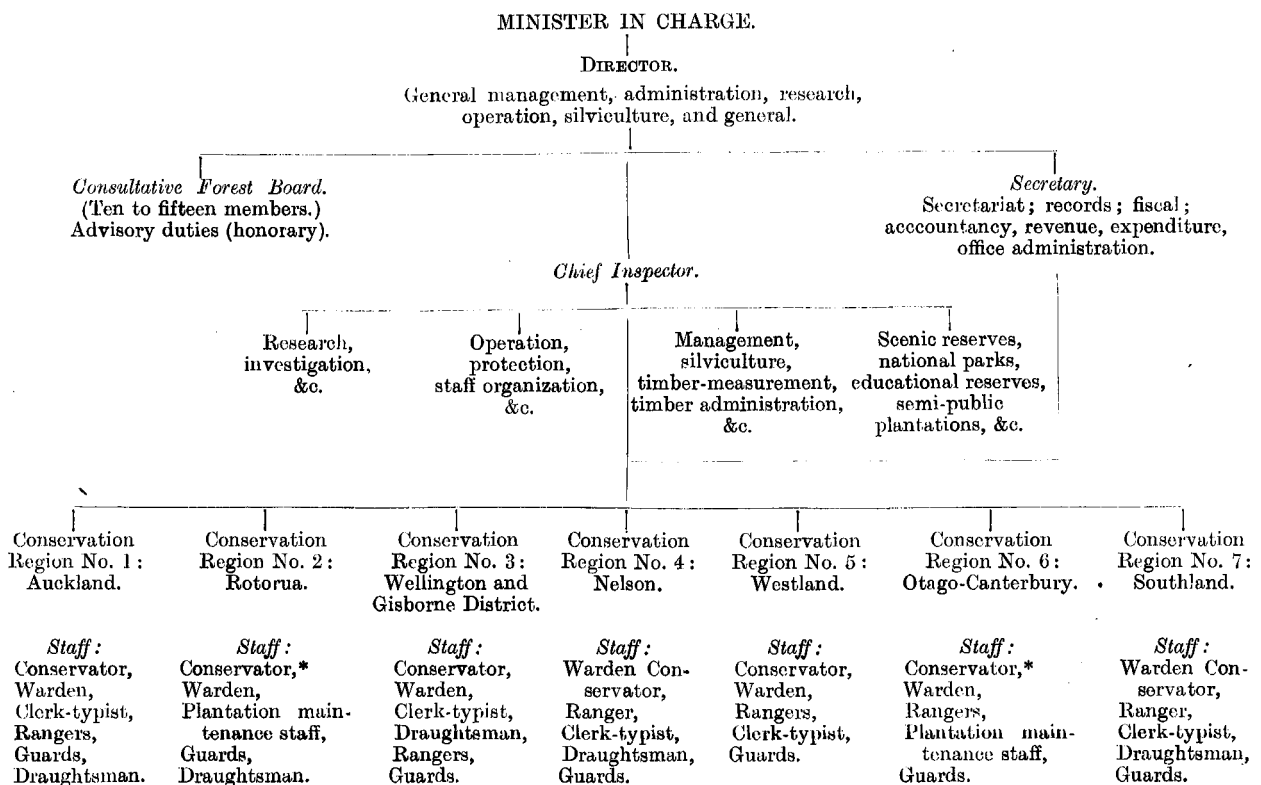
Under this system the successful carrying-out of the national forest policy and of the administration of the State forests would fall entirely upon the executive officer. The forest technicians on the Advisory Board would function simply as advisers. This is the system proposed by the Royal New Zealand Commission on Forestry, 1913.

Recommendation of the Writer.—Your adviser has no hesitation in strongly recommending plan No. 1, for that is the system that has been proven by experience to result in the most efficient and most economical method of national forest administration. It secures a direct line of authority and responsibility from the Minister, through the Director, right down to the forest guard. Moreover, it is the one which assures *unity of control, direction, inspiration, and responsibility.*

Graphic Exposé.

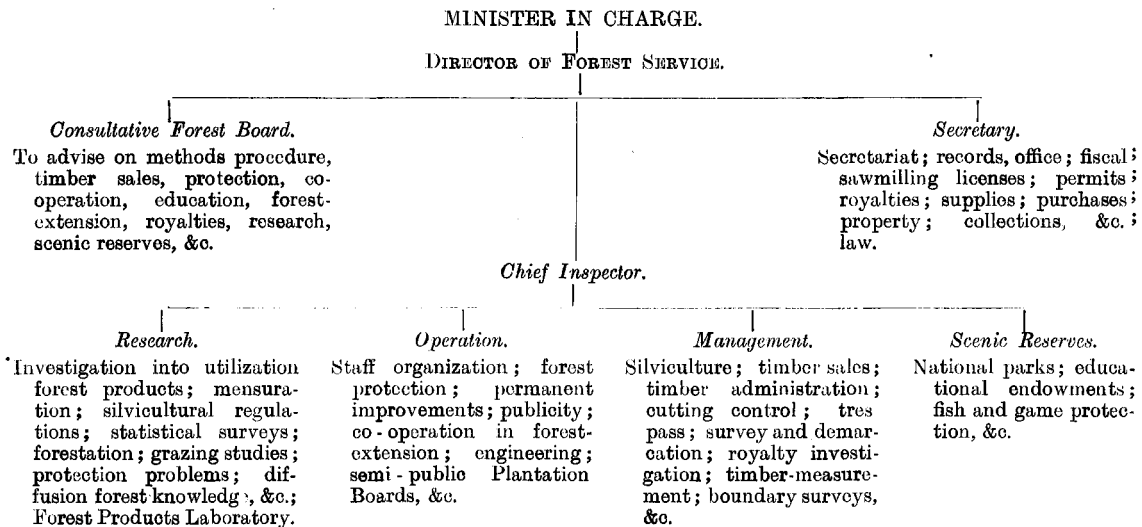
There is graphically exposed herewith the relative positions, duties, and responsibilities of the organization for the New Zealand Forest Service according to plans Nos. 1, 2, and 3.

PLAN NO. 1.—ORGANIZATION OF PERSONNEL AS RECOMMENDED FOR THE NEW ZEALAND FOREST SERVICE BY YOUR ADVISER.

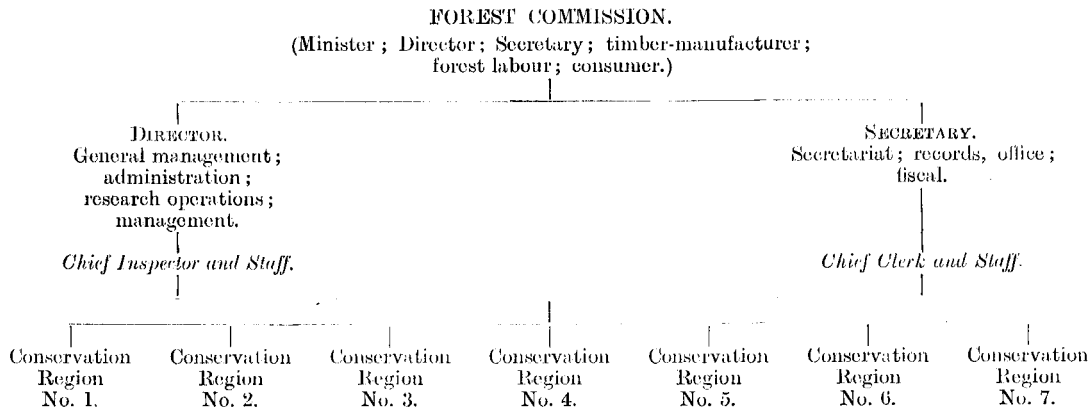


* To act as detailed officer when in other conservations.

PLAN NO. 1.—ORGANIZATION OF WORK AS RECOMMENDED FOR THE NEW ZEALAND FOREST SERVICE BY YOUR ADVISER.

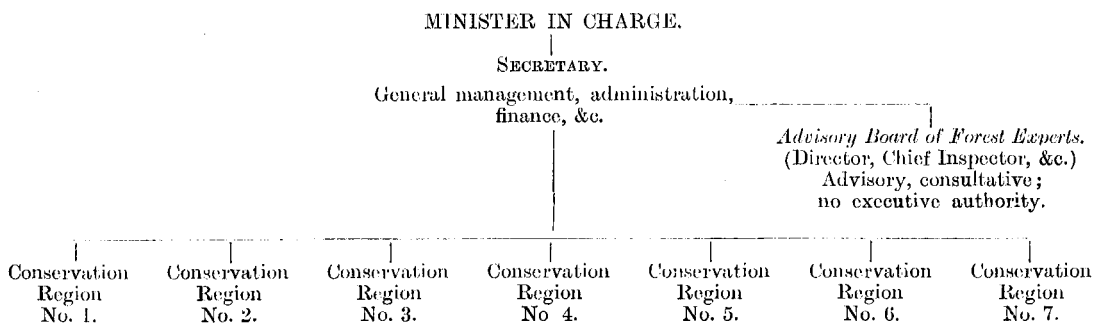


PLAN No. 2.—ALTERNATIVE ORGANIZATION FOR THE NEW ZEALAND FOREST SERVICE.



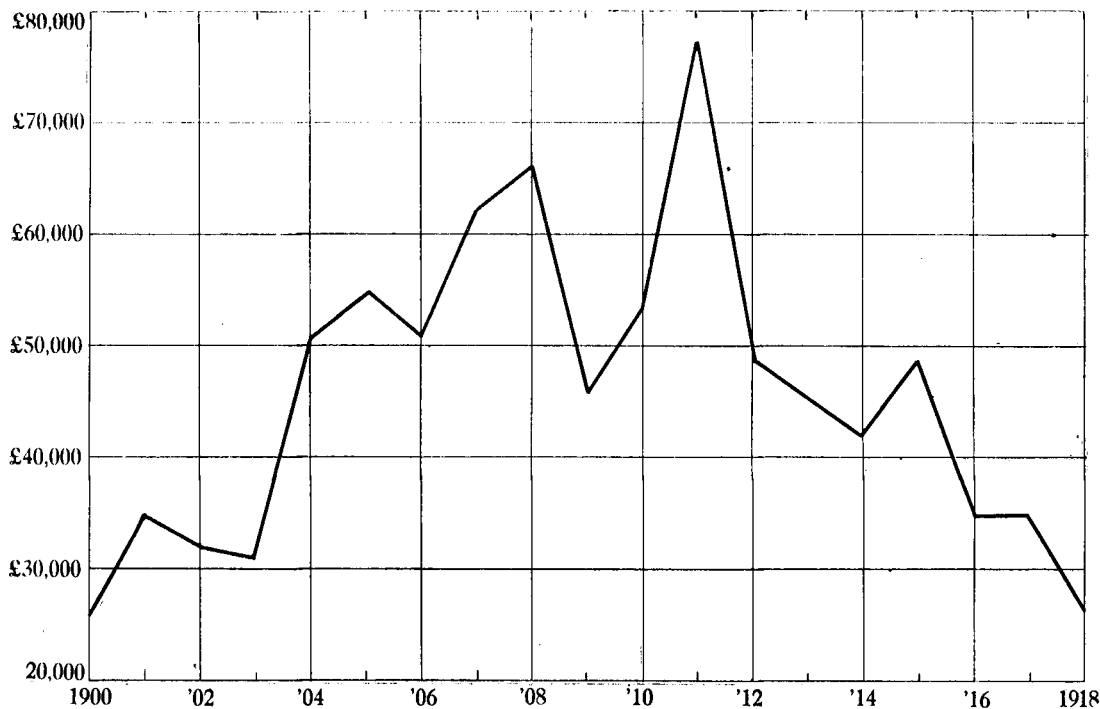
PLAN No. 3.—ORGANIZATION FOR THE NEW ZEALAND FOREST SERVICE.

(Suggested in part by the Royal Commission on Forestry, 1913.)

**FOREST FINANCE.****Critical Formative Period.**

Adequate financial arrangements should be provided over a period of years if the management of the Dominion's forests is to be placed on a sound footing, and the capital investment of the undertaking should be ample and maintained at that standard necessitated by the expansion of operations.

Continuity is vital during the early and critical period of organization of the Forest Service, for during the first five-year period the foundation will be laid, and from it will evolve the definite success or failure of forestry in New Zealand.



TIMBER REVENUES OF NEW ZEALAND.

The expenditure of certain sums during this formative period *will result in immediate increased revenue*, for by it the Forest Service could bring into play proper field supervision of cutting, as well as an ordered system of selling Crown timber, &c.

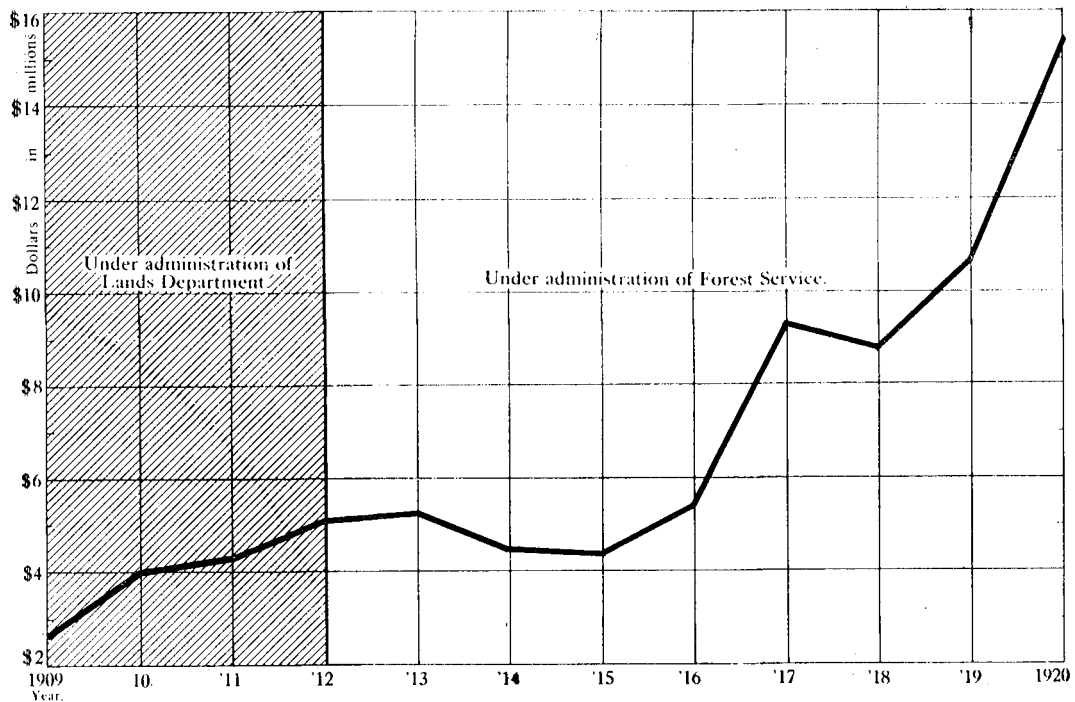
Results of the Forest Service in New Brunswick, Canada.

It has been definitely learned in British Columbia and New Brunswick, for instance, that increased supervision is the *most remunerative form of investment*, and each considered increase has been found to yield very definite monetary returns. In the annual report, 1919, of the Minister in Charge of the Forest Service, New Brunswick, Canada, it states, "The Province is indeed to be congratulated on receiving the largest revenue in the history of the Department, it being upwards of 67,000 dollars in excess of the previous year, or a gain of 8.5 per cent., and 58 per cent. over the amount received in 1917 . . . the improved methods employed in conformity with the Forest Act have to a large extent contributed to this increased revenue. The year just closed has given us the first full year to observe the results that have been obtained under the present Forest Service, and I am glad to report the new conditions are not only eminently satisfactory but have met our best expectations, and the Province is receiving at last a full and honest return of the lumber cut upon its Crown lands. All old methods have been discarded, and a complete reformation made to ensure for the people of the Province a fair and equitable return of the income arising from a territorial revenue."

The Commission of Conservation of Canada recently said, "The New Brunswick Government is to be congratulated upon its progressive and far-sighted forest legislation, and upon the later developments in organization, timber-sales policy, forest survey, land-classification, and forest research. No province of Canada has a more progressive forest policy than New Brunswick." This Government owns over 7,000,000 acres of land, or about one-fourth of the area of the Province. The cut of last season was about 350,000,000 ft., and the expected revenue is over £300,000. This revenue is equivalent to about 20d. per 100 ft. In New Zealand the average net revenue to the State has been about 8½d. per 100 ft.

Results of the Forest Service in British Columbia, Canada.

An inspection of the revenue returns of the Province of British Columbia shows a net increase after the formation of the Forest Service manned by trained men. Herewith is appended a graphical statement of the forest revenue of this province: it is self-explanatory.



FOREST REVENUES OF BRITISH COLUMBIA.

Future Timber-supply.

There are three courses open for securing a permanent timber-supply for the future:—

- (1.) By State man-made plantations. Under this procedure the present generation "pays the piper" directly or through taxation:
- (2.) By the "*laissez-faire*" or "leave things as they are" policy, in the hope that timber-supplies will be available from Russia, Siberia, or somewhere else, or that the country go without wood:
- (3.) By a well-ordered policy of reasoned forest management in which the indigenous forests are administered on a "sustained-yield basis" in perpetuity, and a measure of State and private forest-extension is carried on.

The third system is recommended for New Zealand. Under this system—

- (a.) The financing of the initial development expenditure necessary to place the indigenous forests on a proper working-basis, and to provide for the forest-extension needs, should be met by the raising of a long-term Government debenture issue, to be paid off in part at least by the harvests accruing.
- (b.) Special projects, such as forest stock-taking, forest schools, &c., should be met by special parliamentary vote.
- (c.) The current forest administration should be met by the revenues accruing from the judicious sale of the mature timber resources, &c.

Herewith is presented an *exposé* of the financial needs, and how these funds are to be expended. It is based on a programme which presumes the Forest Service would administer all forests, forest lands, State forests, national parks, scenic reserves, &c. It also presupposes that the third method of financing (development fund, &c.) and the No. 1 plan of Forest Service organization would be adopted.

Funds required and Disposition of Same.

A. CAPITAL DEVELOPMENT FUND.

A capital development fund of £872,300 to be raised by long-term debentures. These debentures to be a direct charge against the State forests and their revenue. This development allotment would be used as follows:—

(1.) Forest organization of the Dominion forests over a five- to seven-year period.	£
Housing	30,000
Improvements, roads, trails, communications, protection facilities	100,000
Demarcation, boundary survey, &c.	60,000
Formation of working-plans, reconnaissance, &c.	30,000
General	20,000
Total	£240,000
(2.) State-forest extension by tree-planting over five- to seven-year period.	
Consolidating and rounding out of:—	
North Island—	
Waiotapu Plantations	2,300
Kaingaroa Plains West	65,000
Kaingaroa Plains	64,000
South Island—	
Greenvale Plantation	50,000
Naseby Plantation	11,000
Balmoral Plantation	39,000
Extension of the Hanmer Springs Plantation	35,000
Blue Mountains planting project	35,000
Total	£302,300
(3.) Formation of a Forest Products Laboratory and Division of Research, and a five-years programme	30,000
(4.) Funds for the acquisition of forests and forest lands	200,000
(5.) State forest loans, co-operative forest-extension, encouragement of forest industry	100,000
Grand total	£872,300

The underlying security behind this debenture issue would be from ten to fifteen times the loan. Unquestionably a national investment of this character can be justified not only by the narrow view of business expediency, but also from the viewpoint of the larger ultimate returns to the country. There is a great mass of evidence to show that standing-timber values are increasing at a much greater rate than ordinary interest charges, and the present low royalties charged by the Government are due for certain and steady advances with the expansion of the industrial needs of a rapidly growing population.

B. SPECIAL PROJECTS.

There are several urgent projects and investigations which should be made by the Service during the development period. The information to be secured from these investigations is essential in the execution of the national forest policy. It is presumed that these amounts would be found by special parliamentary vote. They are—

(1.) Inventory of the forest resources in New Zealand on all public, private, and Native lands	£ 2,000
(2.) General land-classification and soil-survey (made in co-operation with the Department of Agriculture and Lands) of all Native and Crown forest lands and State forests	10,000
(3.) Economic survey of the timber industry (a study of the relation of the industry to the public forests)	2,000
(4.) Special investigations	3,000
(5.) Forest education, publications, library, &c.; extension of forest knowledge of national interest (per year)	6,000

C. CURRENT OPERATION, MANAGEMENT, AND ADMINISTRATION.

The funds for this work should be met entirely out of current forest revenue. *An active policy of forest-utilization, closer administration, supervision, and a well-guarded timber-sale policy will result in an immediate increase in forest revenue*, and, while the cost of this Service must increase as the volume of that work increases, there is abundant indication that this cost will constitute a smaller and smaller percentage of the total yielded by the Forest Service. (The creation of a Forest Service should not result in increasing the drain on the Public Treasury.)

The following organization, and expenditure per year, is suggested :—

(1.) Central executive office at Wellington :—		Per Year £
Director, Secretary, Chief Inspector, Technical Officers, Surveyors, clerical, and office	...	10,000
(2.) Conservation regions :—		
(a.) Auckland (1st)—		
Conservator, Warden, Rangers, guards, and clerical	...	5,000
(b.) Rotorua (2nd)—		
Conservator, Warden, guards, plantation maintenance, &c.	...	8,000
(c.) Wellington and Hawke's Bay (3rd)—		
Conservator, Warden, Rangers, guards, clerical, and office	...	8,500
(d.) Nelson (4th)—		
Conservator, Ranger, guards, clerical, and office	...	4,000
(e.) Westland (5th)—		
Conservator, Warden, Rangers, guards, clerical, and office	...	5,500
(f.) Canterbury and Otago (Tapanui—6th)—		
Conservator, Warden, Ranger, plantation maintenance, &c.	...	8,000
(g.) Southland (7th)—		
Conservator, Ranger, guards, clerical, and office	...	4,000
Total	...	<u>£53,000</u>

SUMMARY.

	£
A. Development Fund to be secured by debenture issue	872,300
B. Special projects during the five-year development period...	47,000
C. Current management and operation per year	53,000

These commitments may appear large and out of all reason, but they must be seriously considered if the forest needs of New Zealand are to be successfully assured.

Salaries.

Experience teaches that nothing has a closer and more direct bearing on State-forest administration than the degree of trained intelligence, resourcefulness, initiative, and *esprit de corps* possessed by the forest officers. If men of the right type, training, ability, and experience are to be attracted and held *the salaries paid must at all times be commensurate with the value and responsibility of their work*. Technical and administrative ability, as shown by results, must be paid for. Success will be secured by a well-paid personnel: failure will result from an incompetent, poorly-paid force.

The writer recommends the following salaries as a basis :—

Category.	Minimum Salary. £	Maximum Salary £
Director	1,000	...
Inspector-General	825	925
Secretary	600	800
Chief Inspector	600	800
Conservator, A category	700	775
Conservator, B category	600	675
Warden, A category	475	540
Warden, B category	425	465
Forest Assistants	325	400
Ranger, A category	350	410
Ranger, B category	320	345
Guards	250	310

Labourers, &c., at ruling rates.

Records Division: Clerical staff, accountants, &c., as per Public Service Commission Regulations.

Lands surveys: Chief Surveyor, &c., in accordance with the Lands and Survey Department standard.

Technical specialists, &c.: Each case on its merits.

Acquisition of Forest and Forest Lands.

Your investigator has suggested the allocation of £200,000 from the Development Fund for the acquisition of forests and forest land.

There are many State-forest properties which for the purposes of efficient management on a sustained-yield basis should be rounded out and consolidated by the purchase and absorption of contiguous forest areas. There are also other very desirable forest lands—for instance, in

private and Native lands (on non-agricultural soils)—throughout the country which would lend themselves to a systematic forestry management. It is therefore suggested that all desirable properties should be examined by this Service and acquired when possible.

This policy can be justified both on the grounds of good business and the future national welfare. There is no resource in the world to-day that is so rapidly appreciating in value as merchantable standing timber.

Housing.

Properly located and equipped Forest Service quarters are essential to the efficient transaction of business, the safeguarding of Government property, and the convenience of the public. Suitable quarters must therefore be provided wherever necessary at the various conservation region offices, on State forests, and for other administrative needs.

In the State-plantation work housing-accommodation has always been provided by the State for permanent officers. These houses are not considered in the nature of a perquisite, but as a privilege for which the officer must pay, and in the consideration of compensation due allowance is always paid for the State accommodation provided. The construction or lease of dwellings solely for the personal needs of a forest officer can be construed only as granting additional compensation, and if such accommodation is provided deductions must be made accordingly. It should be considered as a basic principle that dwellings should be provided for forest personnel only where there is an undeniable need for them, and when it is impracticable for the officer to rent or construct his own living-quarters. Dominion forest dwellings should be constructed only where they serve the actual needs of the Service, and not merely those of the Ranger or other officer by whom they will be occupied. In view of this fact, your investigator suggests the expenditure of £30,000 over the initial period for the construction of suitable accommodation.

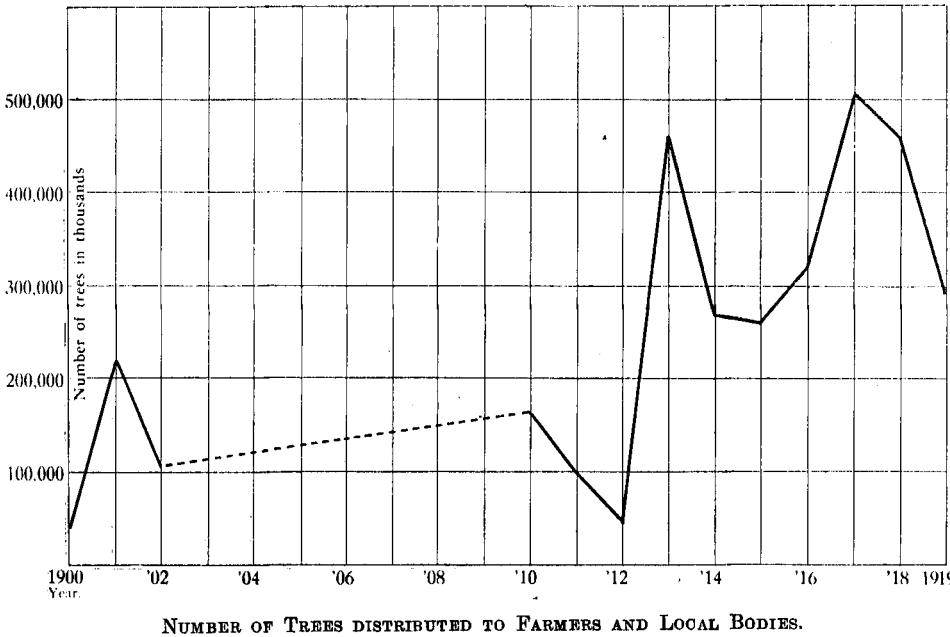
Annual Cost of Forestry in different Countries.

Country.	Expenditure in Pence.	
	Per Acre.	Per Capita.
Prussia	90	..
British Columbia	..	72
France	46	..
Great Britain	24	..
New Brunswick	..	16
Dominion of Canada Government	..	15
New South Wales (figure includes development expense of 2·4d. per acre)	5·7	15
India	3·8	..
New Zealand (average of eighteen years)	0·55	5·8

Annual Revenue of Forestry in different Countries.

Country.	Revenue in Pence.	
	Per Acre.	Per Capita.
British Columbia	..	411
New Brunswick	..	176
Prussia	100*	..
France	87	..
Quebec	..	50
Ontario (Province)	..	30
New South Wales	4·6	12·1
New Zealand (average of eighteen years)	1·03	10·89

* Net.



NUMBER OF TREES DISTRIBUTED TO FARMERS AND LOCAL BODIES.

Financial Aspects of the State-forest-extension Programme (Future Timber Situation, &c.).

Within a generation the wood-consumption of New Zealand will be 1,000 million feet annually, and from what information is available your investigator estimates that the requirements may be satisfied as follows: The Dominion indigenous forests will produce 60 per cent.; the Dominion plantations will produce 10 per cent.; private forests and importations will produce 30 per cent.

Discussing No. (1), the execution of the forest-organization proposals as submitted, together with an active and progressive scheme of road and railway extension, energetic research into the utilization of waste wood, &c., and the wider use of low grades by the consuming public, will, the writer is convinced, secure the estimated amount.

Discussing No. (2), the following programme with regard to the State plantations is submitted to satisfy the amount stated (10 per cent.):—

The following State-forest plantations to be placed immediately on a maintenance basis:—
North Island: Whakarewarewa Plantation, 10,124 acres; Puhipuhi Plantation, 1,306 acres.
South Island: Dusky Hill Plantation, 845 acres; Conical Hills Plantation, 3,672 acres; Pukerau Plantation, 628 acres; Gimmerburn Plantation, 425 acres; Waitahuna Plantation, 11 acres; Dumgree Plantation, 903 acres; Galloway Plantation, 420 acres; Omarama Plantation, 1,437 acres; Raincliff Plantation, 207 acres; Te Kapo Plantation, 29 acres: total, 20,007 acres. To be carried out immediately if it has not already been done.

The following State-forest plantations to be consolidated and rounded out within the next five to seven years:—

Forest Plantation.	Area to be planted.	Area formed to date.	Total formed Area on Completion of Project.
NORTH ISLAND—	Acres.	Acres.	Acres.
Waiotapu	280	10,338	10,618
Kaingaroa Plains West	5,000	..	6,800
Kaingaroa Plains	5,000	7,665*	13,665
SOUTH ISLAND—			
Greenvale	4,161	953	5,169
Naseby	810	1,822	2,760
Balmoral	3,000	922	4,000*
Total	18,251	21,700	43,012

* Includes roads, fire-breaks allowances, administrative, sites, &c.

This consolidation to be secured by the issuance of debentures to the amount of £232,300.

With regard to certain peculiar regional needs and in the interest of economy it is recommended that definite long-time schemes be established by the State in the following regions:—

(a.) The south-western coast of the North Island (sand-dune country) known as the Manawatu West Coast district.

(b.) The Hanmer Springs centre.

(c.) The Blue Mountains, Tapanui.

(d.) The Moutere Hills, Nelson.

(a.) Project might be executed on a co-operative basis between the local bodies and the State: a partnership in which the State provides the planting-material free of cost, supervision, and a part of the cost of formation; the local bodies to provide the land, the local management, &c.; the net proceeds to be divided on an equitable basis.

(b.) Project should be carried on directly by the State planting 11,820 acres at the rate of 500 acres per year. This project would require about twenty-three years to complete. It is suggested that debentures be raised for the amount of £35,000 for a five- to seven-year programme.

(c.) Project should be carried on directly by the State planting 500 acres per year over a period of from twenty-five to thirty years. It is suggested that debentures be raised to the amount of £35,000 for a five- to seven-year programme.

(d.) Project should be carried out by the same principle as (a) scheme.

The projects outlined are such that *definite concentration* may be obtained at certain strategic working-centres. The administration and management of these areas would be very much less than where there are many widely scattered small forests. Surer and more definite results are possible, for the needs of technical management are satisfied.

It should not be construed that the State should confine its interest solely to these areas, but its wider responsibilities in respect to the national welfare should be satisfied by this procedure, and other efforts should be initiated and carried on by private enterprise, assisted by the State wherever expedient.

Project.	Location.	Final Areas to be planted.	Length of Formation Period.	Cost for Initial Five- to Seven-year Period.	To plant in Initial Period.
		Acres.		£	Acres.
(a.)	Manawatu sand-dunes ..	Several thousand	A generation ..	..	..
(b.)	Hanmer Springs district, Canterbury	11,820 at rate of 500 per year	A generation ..	35,000	2,500
(c.)	Blue Mountains, Tapanui ..	15,000 to 20,000 ..	35-40 years ..	35,000	2,500
(d.)	Moutere Hills, Nelson ..	Several thousand ..	A generation ..	..	..

POSITION OF STATE-FOREST PLANTATIONS AT END OF A FIVE- TO SEVEN-YEAR PERIOD.

	Formed Area.	Estimated Formation Outlay.
	Acres.	£
State-forest plantations to be placed in maintenance ...	20,007	...
State-forest plantations to be consolidated ...	43,012	832,300
Forest plantations to be established under a long-time scheme by direct State action ...	5,000	70,000
Totals ...	68,019	£902,300

At the present time there are approximately 40,000 acres of State plantations in New Zealand, and by direct State action it is recommended that this area be increased to about 68,000 acres in seven years by tree-planting in the Rotorua district, Hanmer Springs district, and the Blue Mountains as hereinbefore mentioned. This area, as soon as well-distributed age classes have been secured, and the proper regulatory management installed, should produce from 65,000,000 ft. to 100,000,000 ft. per year. It should return 6 per cent. in interest on investment, and also a handsome reserve each year. Moreover, the active applied management of these properties (and the same may be said of the indigenous forests under management) should result in the sale of the forest products to the consumer at the lowest possible price consistent with the cost of production, and should function also as very effective price-regulators on private offerings.

Discussing No. (3), ("Private forests and importations will produce 30 per cent."): A wide national forestry interest is evidenced all over New Zealand, and the advances that are being made, even without the State assistance, are indicative of the potential possibilities with judicious State encouragement.

The cumulative private forestry effort in New Zealand is very considerable indeed, for there are many municipalities, County Councils, fruitgrowers' associations, and agriculturists who have even at the present time very large and definite investments in private forest plantations.

It is generally accepted in professional circles that timber-growing is the function of the State, but in New Zealand an exception must be made to this general rule, owing to the extraordinarily long growing-season, the remarkable sustained performance of exotic trees (such as *Pinus insignis*, *Cupressus macrocarpa*, *Pinus ponderosa*, and various gums), and the short rotation necessary (twenty-five to thirty years). The growing of trees for special uses in New Zealand is a sound and remunerative business.

The writer, after carefully reviewing the situation, is satisfied that 30 per cent. of the national requirements in timber may be easily met by private and semi-public enterprise. With a rotation of thirty-five years, producing 200 ft. board measure per acre per year, 150,000 to 200,000 acres of planted land under management would be required. He is confident that the local authorities and private corporations and individuals could be stimulated to much greater activity in systematic planting when the profitability of this activity is brought home to them. This aspect of forest-extension work could be considerably expanded, and it should be one of the principal duties of this Service to be the leader of public thought in this matter.

Herewith are indicated several definite constructive means of increasing private forest planting, and by so doing secure a large and considerable private contribution to the timber needs of the nation. These are—

- (1.) Thorough investigation into the most economical methods and cost of growing timber by private individuals, and the diffusion of this knowledge through the country.
- (2.) Considerable expansion of the policy of supplying suitable and appropriate planting-material at cost from the State nurseries.
- (3.) Free assistance to prospective and active planters in technical expert advice, assistance, supervision, and direction.
- (4.) The development of profit-sharing schemes of forest-planting with county bodies, municipalities, co-operative and industrial bodies, &c.
- (5.) Exercising co-operation on developing forest units for sustained yield under multiple private or public ownership combined, and in promoting the acquisition of private forest land by the counties and communities.
- (6.) Allocation of a Loan Fund of £100,000 from which advances might be made on approved projects.

Imported Timber.—If the foregoing programme is adopted, at least in principle, the domestic timber requirements for New Zealand will be assured, with the exception, of course, of providing timbers for special use required for certain specific purposes in railway operations, public works, and other works. The total quantity involved under this heading should be negligible, and would always be satisfied by importation.

PROPOSED PROGRAMME OF THE FOREST SERVICE OPERATIONS FOR THE PERIOD 1920–26.

1. Regional organization of Service.
2. Development of practical and businesslike timber-sale regulations, and the formulation of a basis for future royalty adjustments.
3. Formation and operation of an efficient forest fire-protection organization.

4. Establishment of a Forest Products Laboratory and Forest Experiment Station; and the solution of certain pressing economic problems, such as—
 - Standardization of silvicultural practice: Forestation of sand-dunes; control of the wood-borer; development and presentation of working-plans for farm forestry; solution of the forest-taxation problem.
 - Logging and milling waste, and means of overcoming same: The pulp and paper possibilities of New Zealand woods; use of mill-waste; increased utilization of inferior timber-trees; study of the mechanical and technical qualities of native trees; artificial seasoning of timber, &c.
5. An inventory of the forest resources of New Zealand.
6. Classification of the soils of State forests, Crown forest lands, and deletion of agricultural soils for settlement.
7. Economic survey of the timber industry and the wood-using industries.
8. Forest survey and demarcation of State forests up to the limits of available funds.
9. Development of administrative machinery and working-plans for the protection of the national parks and scenic reserves, &c.
10. Formation of preliminary working-plans for all the State plantations.
11. Aggressive campaign and development of ways and means to increase semi-public and private tree-planting.
12. Planting by the State of 20,000 acres in the North and South Islands.
13. Improvement in the grazing resources of the State forests.
14. Dedication of all Crown forests on absolute forest soils as State forests in—(a) Auckland East; (b) South Auckland and Taupo district; (c) Hawke's Bay North; (d) Taranaki and Wanganui; (e) Wellington, Tararua Range, and its continuation; (f) Nelson and Marlborough; (g) Westland; (h) Canterbury, and such districts as the Hope, Boyle, and doubtful river country; (i) Otago, West Coast; (j) Catlin's, Blue Mountains; (k) Southland, Stewart Island, Longwood.
15. Construction of a forest atlas and field plans.
16. Title regulation of all State forests, State plantations; and assignation by statute for scientific management in perpetuity.
17. The judicious and careful expenditure of £240,000 in the construction of forest housing-accommodation, forest improvements, roads, protection needs, demarcation, boundary surveys, and formation of preliminary working-plans for State forests.

SECTION V.—RESULTS OF A FOREST POLICY IN NEW ZEALAND.

The resultant will be—

- (1.) Continued supplies for wood-using industries at the lowest possible cost.
- (2.) Increase in the national wealth.
- (3.) A continuous and sustained supply of timber to meet the local and national needs of the people of New Zealand.
- (4.) The adequate protection of all water-supply sources, and safe control of stream-flow.
- (5.) Substantially increased revenues from the sale of public timber.
- (6.) The utilization of all forest soils at their productive capacity.
- (7.) The closest use of all the forest resources of the people.
- (8.) Effective fire protection of all timber areas.
- (9.) The considerable participation by the individual in private forestry.
- (10.) Stability of the timber industry.
- (11.) Improved conditions for forest workers.
- (12.) Effective administration of the game and fish resources.
- (13.) Assured preservation and improved progressive management of the recreational uses of the national parks, scenic reserves, &c.

SECTION VI.—APPENDICES.

APPENDIX I.—STATE FORESTS ACCOUNT: RECEIPTS AND PAYMENTS.

(From New Zealand Government Gazette.)

Receipts.

Year.	Debentures.	Rents, &c.	Consolidated Fund.	Year.	Debentures.	Rents, &c.	Consolidated Fund.
	£	£ s. d.	£		£	£ s. d.	£
1886	1,500	..	..	1905	..	12,784 2 8	..
1887	..	3,000 13 0	..	1906	..	14,385 7 3	..
1888	5,500	3,772 12 11	..	1907	..	20,426 1 4	..
1889	1,000	2,433 13 0	..	1908	..	18,258 0 3	..
1890	..	3,754 9 1	..	1909	..	32,619 5 9	..
1891	..	3,973 6 11	..	1910	..	15,425 10 4	10,000
1892	..	1,964 15 10	..	1911	..	14,870 19 7	5,000
1893	..	1,212 17 10	..	1912	..	35,198 2 5	5,000
1894	..	1,931 6 6	..	1913	..	11,525 4 0	5,000
1895	..	1,071 8 3	..	1914	..	11,354 11 11	5,000
1896	..	2,468 6 6	..	1915	..	14,372 14 3	6,000
1897	..	6,504 4 10	..	1916	..	20,611 7 10	9,000
1898	..	10,995 13 1	..	1917	10,000	12,881 11 8	4,250
1899	..	5,884 6 6	..	1918	28,100	13,299 2 2	..
1900	..	8,845 18 10	..	1919	26,900	7,529 9 8	10,000
1901	..	14,915 5 3	..	1920	65,000	8,513 15 10	..
1902	..	17,188 11 5	..				
1903	..	3,870 14 10	..	Totals	138,000	374,534 14 11	59,250
1904	..	16,726 3 5	..				

Payments.

Year.	Annual Expenditure.	Interest on Debentures.	Re-deemed.	Year.	Annual Expenditure.	Interest on Debentures.	Re-deemed.
	£ s. d.	£ s. d.	£		£ s. d.	£ s. d.	£
1886	1,012 7 4	..	..	1905	18,675 5 5	..	..
1887	7,671 13 0	196 17 8	..	1906	20,188 5 3	..	..
1888	3,793 0 0	200 0 0	..	1907	24,951 2 11	..	..
1889	2,783 15 4	391 0 7	..	1908	25,831 6 4	..	..
1890	..	400 0 0	..	1909	26,962 0 0	..	..
1891	428 15 4	..	7,000	1910	22,187 0 6	..	..
1892	25 0 0	..	1,000	1911	23,446 3 10	..	..
1893	..	..	..	1912	22,810 13 8	..	..
1894	15 4 8	..	..	1913	22,169 3 8	..	..
1895	22 13 6	..	..	1914	28,442 9 11	..	..
1896	481 17 1	..	..	1915	30,318 2 4	..	..
1897	2,472 7 10	..	..	1916	30,312 15 0	..	4,000
1898	5,802 1 4	..	..	1917	27,089 10 8	..	..
1899	3,340 6 10	..	..	1918	41,851 13 7	902 6 9	..
1900	4,002 9 7	..	..	1919	41,343 10 1	3,577 0 3	..
1901	6,857 9 2	..	..	1920	66,819 2 6	1,861 10 11	..
1902	10,334 13 7	..	..				
1903	11,017 19 6	..	..	Totals	549,044 1 11	7,528 16 2	12,000
1904	15,584 2 2	..	..				

APPENDIX II.—SCENIC RESERVES, NATIONAL PARKS, AND FOREST RESERVES.

Scenic Reserves.

Up to the 31st March, 1920, there were 525 scenic reserves under the Scenery Preservation Act, with a total area of 312,076 acres.

National Parks.

National parks are under special Acts or under section 321 of the Land Act, 1908.

Egmont National Park.—This park was made under the Egmont National Park Act, 1900. The area is 78,957 acres. The Act places the control and administration of the park in the Commissioner of Crown Lands for Taranaki (Chairman), two members appointed by the Governor-General, and one to be appointed by each of the following bodies: The Hawera Borough Council, the New Plymouth Borough Council, the Taranaki County Council, the Hawera County Council, the Stratford County Council, and the Opunake Town Board.

Tongariro National Park.—This park was created by the Tongariro National Park Act, 1894. The area gazetted is 63,132 acres, but the Government has under consideration the addition

of a further area of about 75,700 acres, part of which is State forest. The control is now vested in the Tourist and Health Resorts Department.

Sounds National Park.—The Sounds National Park was set apart under sections 321 and 322 of the Land Act, 1908. The area is 2,524,300 acres, and part is under year-to-year lease. Authority was made in 1916 to give coal leases and licenses over the area.

Waimakariri National Park.—This was set apart under sections 321 and 322 of the Land Act, 1908. The area gazetted is 150,000 acres, and includes forest reserves of 48,000 acres, or 102,000 net.

Forest Reserves.

Reserves for the growth and preservation of timber, timber reserves, &c. These are all made under the Land Act, and are administered by the Lands Department. Their total area is about 521,365 acres.

APPENDIX III.—CROWN AREAS AFFECTING THE WATER-SUPPLY OF MUNICIPALITIES.

Centre of Population.	Acreage.	Population influenced.	Remarks.
Whangarei	2,200	4,000	Crown lands and forest reserves.
Auckland	4,400	138,000	Forest reserves.
Thames	20,000	4,000	Crown lands.
Te Aroha	4,600	2,000	State forests.
Opotiki	30,000	2,000	Crown lands and national endowment.
Taumarunui	1,300	2,000	National endowment.
Wanganui	..	14,000	National Park (Tongariro).
Masterton	250,000	138,000	State forests and forest reserves.
Dannevirke			
Woodville			
Featherston			
Levin			
Pahiatua			
Carterton			
Wellington	31,000	10,000	National-endowment lands.
Nelson			
Westport			
Greymouth			
Hokitika			
Ross	20,000	3,000	

APPENDIX IV.—TIMBER OUTPUT, EXPORT, AND IMPORT.

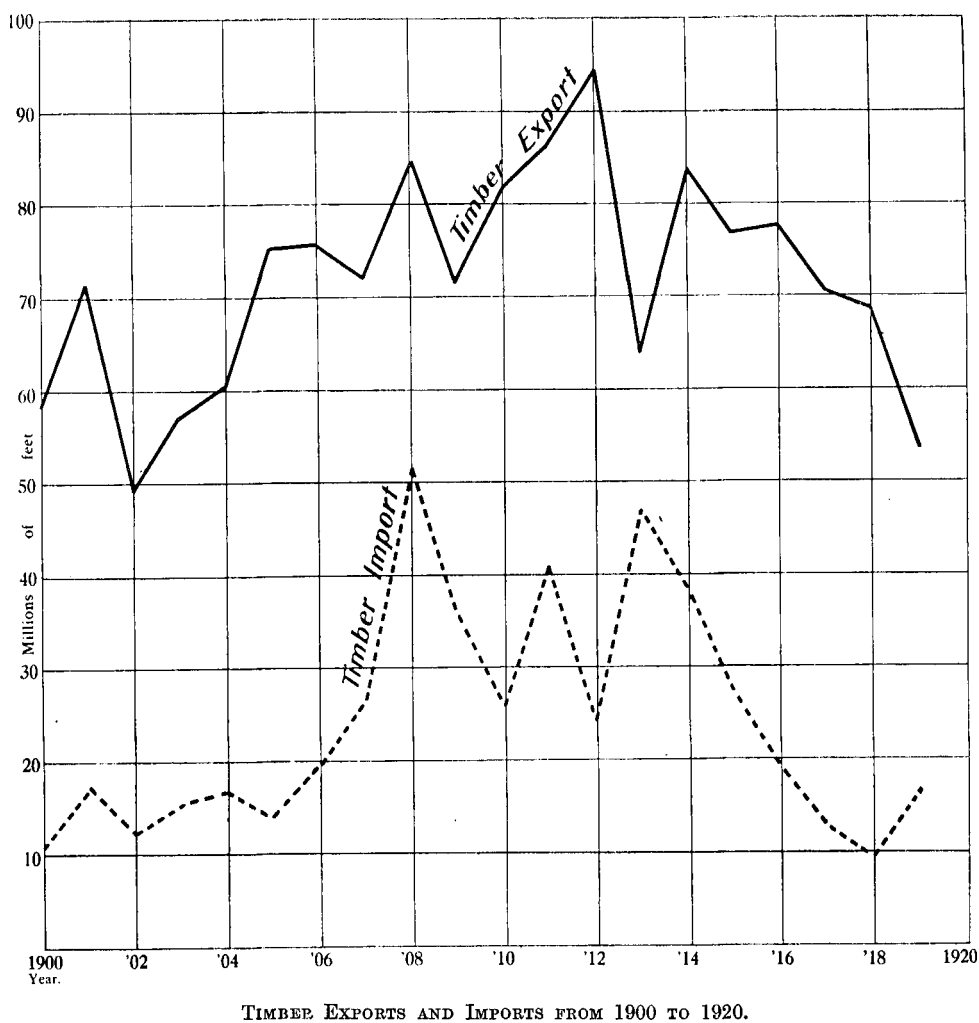
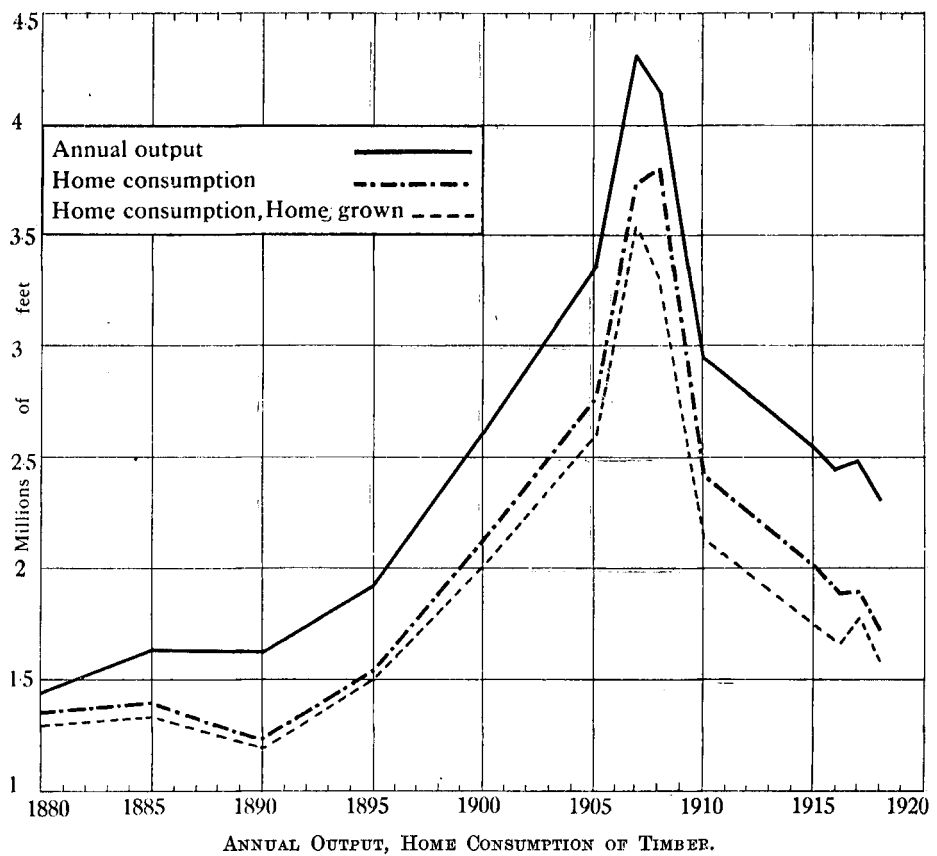
The following table gives the output, export, and import in thousands of feet (superficial) of sawn timber for the years shown. These figures exclude all timber not sawn (*i.e.*, posts, laths, shingles, &c.), the consumption per head being in feet (superficial).

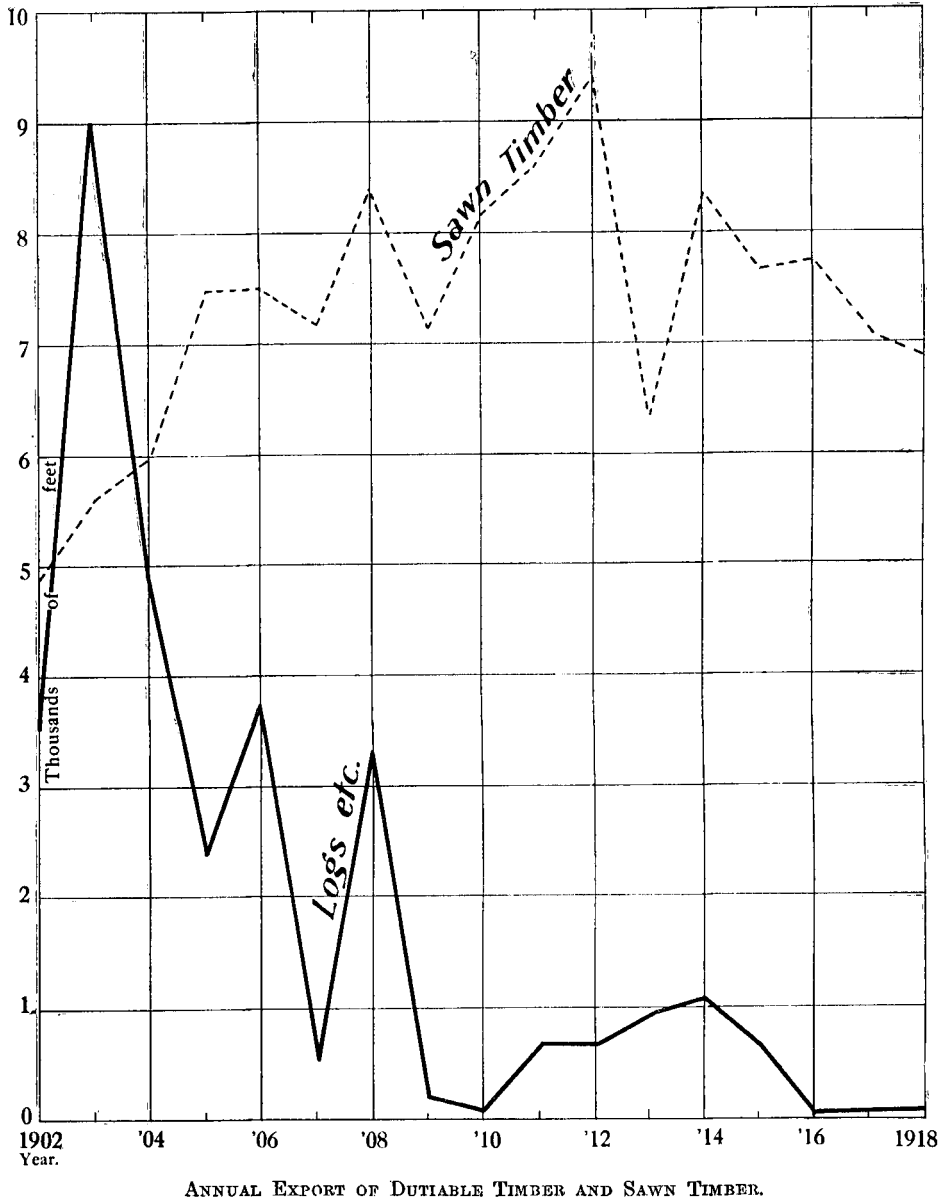
Export is mainly confined to Australia and outlying islands; import is mainly from Australasia. A certain quantity of Oregon was imported previous to the war (practically all from the United States of America). In the earlier years—*i.e.*, before 1900—a certain amount was imported from Europe. This has been negligible since 1900.

QUANTITIES IN SUPERFICIAL MEASURE.

Year.	Output.*	Import.*	Total.*	Export.*	Home Consumption.*	Population.*	Consumption in Feet per Head.
1880 ..	143,146	4,058	147,204	13,180	134,024	490	273·5
1885 ..	163,741	3,727	167,468	29,350	138,118	578	238·9
1890 ..	162,116	4,729	166,945	42,824	124,121	627	197·9
1895 ..	191,054	3,624	194,678	40,385	154,293	703	219·5
1900 ..	261,584	10,839	272,423	57,517	214,906	773	278·0
1905 ..	336,471	14,136	350,607	75,370	275,237	889	309·2
1907 ..	432,032	20,030	450,062	75,529	374,533	929	409·8
1908 ..	413,869	51,828	465,697	84,554	381,143	961	396·6
1910 ..	296,033	25,519	321,552	81,940	239,612	1,004	328·6
1915 ..	251,097	27,569	278,666	76,797	201,763	1,102	183·1
1916 ..	245,568	19,112	264,680	77,516	187,164	1,101	170·0
1917 ..	247,980	12,864	260,844	70,748	190,096	1,098	173·1
1918 ..	227,803	9,588	237,391	68,697	168,688	1,108	152·1

* In thousands.

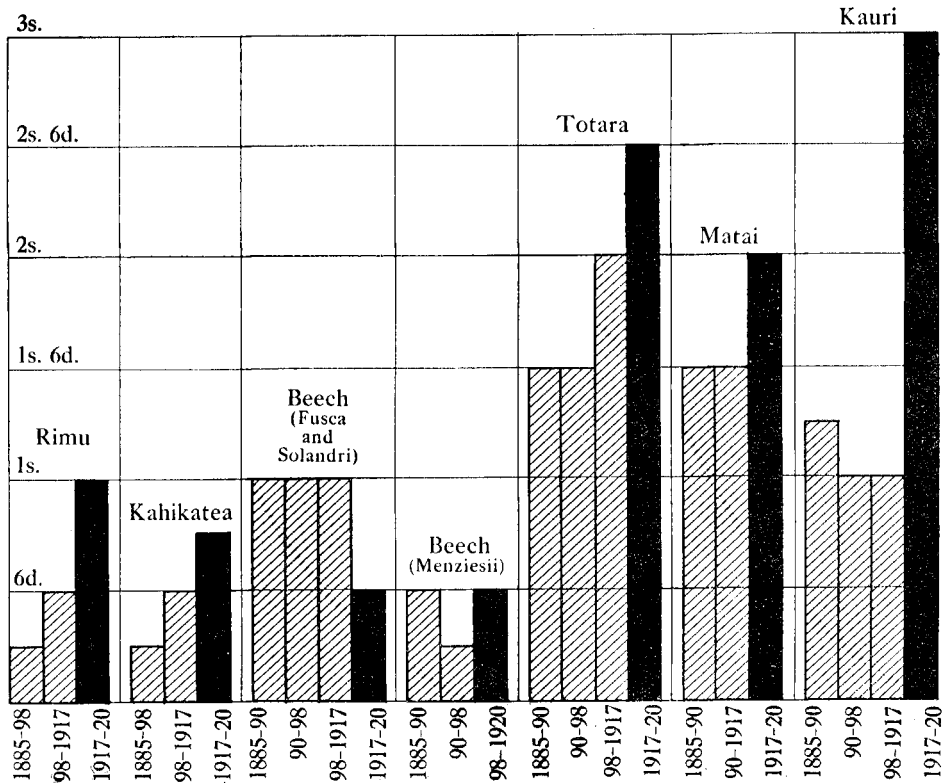




APPENDIX V.—ROYALTIES.

The following are the minimum royalties per 100 superficial feet payable on timber purchased under the State Forests Act, Land Act, and Mining Act. In the majority of districts these rates prevail, but in the Auckland and a few other land districts Crown timber has for the last few years been sold by public competition—*i.e.*, by auction or tender.

Year.	Rimu, Miro, Tanekaha.	Kahikatea, Kahikawaka.	Beech (<i>N. fusca</i>) (<i>N. Solandri</i>).	Beech (<i>N. Menziesii</i>).	Totara.	Matai, Puriri, Maire, Silver-pine.	Kauri.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1885	0 3	0 3	1 0	0 6	1 6	1 6	1 3
1890	0 3	0 3	0 6	0 3	1 0	1 0	0 6
1898	0 6	0 6	1 0	0 6	2 0	2 0	1 0
1901 (September) ..	1 0	1 0	1 0	0 6	2 0	2 0	1 6
1901 (October) ..	0 6	0 6	1 0	0 6	2 0	2 0	1 0
1908	0 6	0 6	1 0	0 6	2 0	2 0	1 0
1917	1 0	0 9	0 6	0 6	2 6	2 0	3 0



ROYALTIES ON SAWN TIMBER, 1885-1920.

Schedule A.—Rates of Royalty, 1917.

Ordinary royalty shall be paid by the purchasers of timber at such rates as may be fixed, being not less in any case than the following rates:—

	Per 100 sup. ft.
	s. d.
Kauri	3 0
Totara	2 6
Matai, puriri, maire, silver-pine, mangleao ...	2 0
Rimu, miro, tanekaha, rata	1 0
Kahikatea, kahikawaka (cedar)	0 9
Beeches (called " birches "), taraire, tawa, and all other timbers ...	0 6
Puriri, totara, kauri, silver-pine, and matai sleepers and posts...	2 0
Other sleepers, posts, and rails, not less than 10s. per 100 in number ...	2 0
Fencing-stakes, not less than 5s. per 100 in number ...	2 0
Shingles, not less than 1s. per 100 in number...	2 0
Firewood (per cord)	2 0

No standing totara or black-pine, and no timber required for or suitable for milling purposes, to be permitted to be cut for posts, rails, fencing-stakes, shingles, firewood, &c.

The royalty to be paid under this schedule is subject to the right of the Commissioner to cause any timber to be sold by appraisement or by auction in the manner set forth in the foregoing regulations.

[Extract from State Forests Regulations, 1908.]

RATES OF ROYALTY.

31. Royalty on timber shall be paid at the rates specified in the classified scale in Schedule A; but where the timber is easily accessible and can be procured without great difficulty the Commissioner may increase the amount of the royalty specified.

Royalty on the Rights to Reserved Areas.

37. The royalties payable on the reserved areas shall be upon the scale fixed by the regulations for the time being in force when a license to cut timber therein is issued, or may be at the rates fixed by auction for the original license, as may be decided by the Commissioner when granting the license for such reserved area; and nothing herein shall entitle a licensee to claim that the royalties then payable shall be on the scale set forth in these regulations. When a license to cut on any portion of a reserved area is granted it shall be granted subject to the regulations in force at the date of the granting of such license.

Timber, &c., may be sold by Auction or Appraisement. Moneys payable to Receiver.

All timber and other produce within any forest may be disposed of either by auction at per 100 ft., or by appraisement, or license to fell, upon such terms as the Commissioner shall prescribe; and all moneys which shall be payable for such timber or other produce shall be paid, in such manner as he direct, to the Receiver of Land Revenue, to be credited by him to the State Forests Account as required by section 6 of the said Act. . . .

Rates of Royalty, 1908.

Ordinary royalty shall be paid by the purchasers of timber in forests according to the following classification:—

Class.	Per 100 sup. ft.
I. Totara, matai, puriri, maire-raunui, silver-pine, and pohutukawa—not less than	s. d. 2 0
II. Kauri—not less than	1 0
III. Totara and matai less than 25 ft. in length, rata, tangeao, tooth- and entire-leaved beeches, manuka (tea-tree), manoa, tanekaha, kawaka, kahikawaka—not less than	1 0
IV. Rewarewa, mapau, toro, hinau, taraire, miro—not less than	0 6
V. Mountain and silver beech—not less than	0 6
VI. Rimu (red-pine), kahikatea (white-pine), kamai, pukatea, tawa—not less than	0 6
VII. Puriri, totara, kauri, silver-pine, and matai posts and sleepers to be charged under Classes I and III.	
Other posts, rails, and sleepers (per 100)	8 0
Fencing-stakes (per 100)	4 0
Firewood (per cord)—not less than	1 0

No standing totara or black-pine, and no timber required or suitable for milling purposes, to be permitted to be cut under this class.

The royalty to be paid under this schedule is subject to the right of the Commissioner to cause any timber to be sold by appraisement or by auction in the manner set forth in the foregoing regulations. . . .

Wood Cutting and Splitting Licenses, 1908.

A license to cut firewood, or to split posts, slabs, rails, palings, shingles, and fencing-stakes, in forests cleared of milling-timber, or in forests which are not heavily timbered, may be granted by the Conservator as follows:—

- (a.) For an area 200 ft. by 200 ft., at a charge of £2 10s. per annum per man; for an area 200 ft. by 100 ft., at a charge of £1 10s. per annum per man; for an area 200 ft. by 50 ft., at a charge of £1 per annum per man. In sparsely timbered country these areas may be extended at the discretion of the Conservator, but so as not to include more timber than can be felled by one man within one year. Or—
- (b.) For a license to cut one or more kauri-trees at schedules rates. Or—
- (c.) On payment at the following royalties:—

Totara, Black-pine, Kowhai, and Broadleaf Timbers.—Posts: Royalty per 100—Posts 6 in. x 3 in. x 5 ft. 6 in. long, 8s.; 6 in. x 4 in. x 6 ft. long, 12s.; 6 in. x 5 in. x 7 ft. long, 16s.; 6 in. x 6 in. x 7 ft. long, 21s.; 8 in. x 6 in. x 7 ft. long, 28s.; 10 in. x 8 in. x 7 ft. long, 46s.; 12 in. x 10 in. x 7 ft. long, 70s.; 12 in. x 12 in. x 7 ft. long, 84s. Telegraph poles and piles: Royalty per 100 running feet—6 in. x 6 in., 3s.; 8 in. x 8 in., 5s. 6d.; 10 in. x 10 in., 8s. 6d.; 12 in. x 12 in., 12s. Other sizes in proportion, up to 25 ft. long; over 25 ft. long, double royalty. (NOTE: Royalty on telegraph-poles to be computed on butt measurements.)

Other Timbers.—Post, rails, and sleepers: Royalty per 100 posts, &c.—Up to 7 ft. x 6 in. x 6 in., 8s.; 8 in. x 6 in. x 7 ft. long, 14s.; 10 in. x 8 in. x 7 ft. long, 23s.; 12 in. x 10 in. x 7 ft. long, 35s.; 12 in. x 12 in. x 7 ft. long, 42s. Stakes of all kinds up to 5 ft. 6 in. x 4 in. x 4 in. at the rate of 4s. per 100 stakes.

Miscellaneous.—Drain slabs, 12 in. x 1 in. x 12 in., 6d. per 100.

Amended Regulations under State Forests Act, 1885, in respect of Royalties on Timber.

Class.	[Gazetted 26th September, 1901.]	Per 100 sup. ft.
I. Totara and matai (exceeding 40 ft. by 2 ft. diam.)	...	s. d. 4 0
II. Totara and matai (25–40 ft. length by 1–2 ft. diam.)	...	2 0
III. Kauri	...	1 6
IV. Totara and matai (less than 25 ft. by less than 1 ft. diam.), miro, rata, tangeao, beech (<i>fusca</i> and <i>Solandrii</i>), manuka, manoa, tinekaha, kawaka, kaikawaka	...	1 0
V. Rewarewa, mapau, toro, hinau, taraire	...	0 6
VI. Beech (<i>cliffortioides</i> and <i>Menziesii</i>)	...	0 6
VII. Rimu, kahikatea, kamai, tawa	...	1 0
VIII. Puriri, totara, kauri, matai posts under Classes I to IV.		
Other posts and rails (per 100)	...	8 0
Stakes, fencing (per 100)	...	4 0
Firewood (per cord)	...	1 0

(These regulations were revoked by *Gazette* notice of 3rd October, 1901.)

[Gazetted 6th March, 1890.]		Per 100 sup. ft.	
Class.		s.	d.
I.	Totara and matai (exceeding 40 ft. by 2 ft. diam.)	1	0
II.	Totara and matai (25–40 ft. length by 1–2 ft. diam.)	1	0
III.	Kauri	0	6
IV.	Totara and matai (less than 25 ft. by less than 1 ft. diam.), miro, rata, tangeao, beech (<i>fusca</i> and <i>Solandri</i>), manuka, manao, tinekaha, kawaka, kaikawaka	0	6
V.	Rewarewa, mapau, toro, hinau, taraire	0	3
VI.	Beech (<i>cliffortioides</i> and <i>Menziesii</i>)	0	3
VII.	Rimu, kahikatea, kamai, tawa	0	3
VIII.	Puriri, totara, kauri, matai posts under Classes I to IV.		
	Other posts and rails (per 100)	4	0
	Stakes, fencing (per 100)	2	0
	Firewood (per cord)	1	0

[Gazetted 6th January, 1898.]		Per 100 sup. ft.	
Class.		s.	d.
I.	Totara and matai (exceeding 40 ft. by 2 ft. diam.)	2	0
II.	Totara and matai (25–40 ft. length by 1–2 ft. diam.)	2	0
III.	Kauri	1	0
IV.	Totara and matai (less than 25 ft. by less than 1 ft. diam.), miro, rata, tangeao, beech (<i>fusca</i> and <i>Solandri</i>), manuka, manao, tinekaha, kawaka, kaikawaka	1	0
V.	Rewarewa, mapau, toro, hinau, taraire	0	6
VI.	Beech (<i>cliffortioides</i> and <i>Menziesii</i>)	0	6
VII.	Rimu, kahikatea, kamai, tawa	0	6
VIII.	Puriri, totara, kauri, matai posts under Classes I to IV.		
	Other posts and rails (per 100)	8	0
	Stakes, fencing (per 100)	4	0
	Firewood (per cord)	1	0

[Gazetted 2nd September, 1883.]		Per 100 sup. ft.	
Class.		s.	d.
I.	Totara and matai (not exceeding 40 ft. by 2 ft. diam.)	2	0
II.	Totara and matai (25–40 ft. length by 1–2 ft. diam.), puriri, maire, pohu-tukawa	1	6
III.	Kauri	1	3
IV.	Totara and matai (less than 25 ft. by less than 1 ft. diam.), miro, rata, tangeao, beech (<i>fusca</i> and <i>Solandri</i>), manuka, manao, tinekaha, kawaka, kaikawaka	1	0
V.	Rewarewa, mapau, toro, hinau, taraire	0	9
VI.	Beech (<i>cliffortioides</i> and <i>Menziesii</i>)	0	6
VII.	Rimu, kahikatea, kamai, tawa	0	3
VIII.	Puriri, totara, kauri, matai posts under Classes I to IV.		
	Other posts and rails (per 100)	4	0
	Stakes, fencing (per 100)	2	0
	Firewood (per cord)	1	0

APPENDIX VI.—BRIEF SUMMARY OF LEGISLATION AFFECTING FORESTS.

The Act under which State forests are made and administered is the State Forests Act, 1908. This Act gives authority for—Proclaiming Crown lands as State forests; the appointment of a Minister and officers; the provision of funds; the granting of licenses to cut timber; the making of regulations; the erection of employees' dwellings; the establishment of schools of forestry; the granting of assistance to local bodies towards making forest plantations; and the withdrawal of lands from reservation under the Act.

Section 34 of the War Legislation and Statute Law Amendment Act, 1918, provides authority for—The State to cut and sell timber; the State to buy land for forestry purposes; the setting-apart of Crown lands as provisional State forests; the taking of land for forestry purposes under the Public Works Act; the making of regulations for limiting the export of timber; and the prohibiting of the sale of standing timber, whether on public or private lands, except subject to conditions which may be prescribed.

The State Forests Amendment Act, 1919, authorizes the setting-apart of national-endowment lands as provisional State forests, and apportions the revenue from the land so set aside equally between national-endowment revenue and State-forests revenue.

Section 69 of the Reserves and other Land Disposal and Public Bodies Empowering Act, 1915, authorizes the sale of young trees to farmers and public bodies. Under this authority trees are disposed of at about 10 per cent. over actual cost of raising them in the State nurseries.

Section 20 of the Mining Act, 1908, authorizes the felling of timber on State forests where such timber is required solely for mining purposes. Section 65 of the said Act authorizes a person holding a miner's right to cut timber for his use from unalienated Crown lands which are open for mining. Section 100 of the said Act protects—in cases where mining-rights are granted over forest lands—any rights which may have already been granted to cut, remove, or float timber. Section 147 of the said Act authorizes the Governor-General to define and specify in any mining district areas within which timber licenses and other timber-cutting rights may be granted exclusively under the Mining Act (such areas are called "Warden's timber areas"), and other areas within which timber licenses and other timber-cutting rights may be granted under the Land Act exclusively (such areas are called "Land Board's timber areas").

Section 148 of the Mining Act provides that all rents, royalties, and fees received in respect of timber-cutting rights shall be deemed to be goldfields revenue in the case of rights granted within the Warden's timber areas, and territorial revenue in the case of rights granted within the Land Board's timber areas; nevertheless, in the case of timber-cutting rights which are granted in certain areas known as "Midland Railway mining reserves" the rents, royalties, and fees are deemed to be goldfields revenue.

Under section 307 of the Land Act, 1908, may be granted licenses to hold areas not exceeding 80 acres, to be used as sites for sawmills or areas on which to fell or remove timber or bark from Crown lands, and, under section 312, licenses to cut timber.

Section 312 of the said Act authorizes the granting of timber licenses and the setting-apart of future reservations for the licensee.

Section 316 of the said Act provides for the prosecution of any person found in wrongful possession of timber cut from State forests or Crown lands.

Section 315 of the Land Act, 1908, provides for the leasing of open portions of State forests.

APPENDIX VII.—SUMMARY OF TIMBER LICENSES ISSUED.

Under the Land Act, 1908; the State Forests Act, 1908; the Mining Act, 1908 (the Regulations made thereunder in force on the 31st March, 1920).

Schedule.	Category.	Number.	Area.	Reservations.
			Acres.	Acres.
1	Crown lands	73	63,708	8,929
	State forests	42	19,541	23,355
2	Mining districts	101	31,775	67,704

LICENSES ISSUED UNDER SUBSECTION (6) OF SECTION 34 OF THE WAR LEGISLATION AND STATUTE LAW AMENDMENT ACT, 1918.

Over private land...	...	...	...	83
Over Native land ...	...	...	...	20
Total	...	...	...	103

SCHEDULE 1.

Licenses issued by Minister of Lands.

District.	Sawmill Areas.		Reservations.	Splitters' Licenses, &c.	
	Number.	Area.	Area.	Number.	Area.
		Acres.	Acres.		Acres.
North Auckland ..	6	8,900	..	..	..
Auckland	19	29,610	..	..	..
Wellington	17	16,741	329	..	..
Nelson	1	494	..	..	..
Marlborough.. ..	4	800	2,700	..	..
Canterbury	..	..	..	4	381
Southland	15	3,813	4,700	..	..
Otago	11	3,350	1,200	..	..
Totals	73	63,708	8,929	4	381

Licenses issued by Commissioner of State Forests.

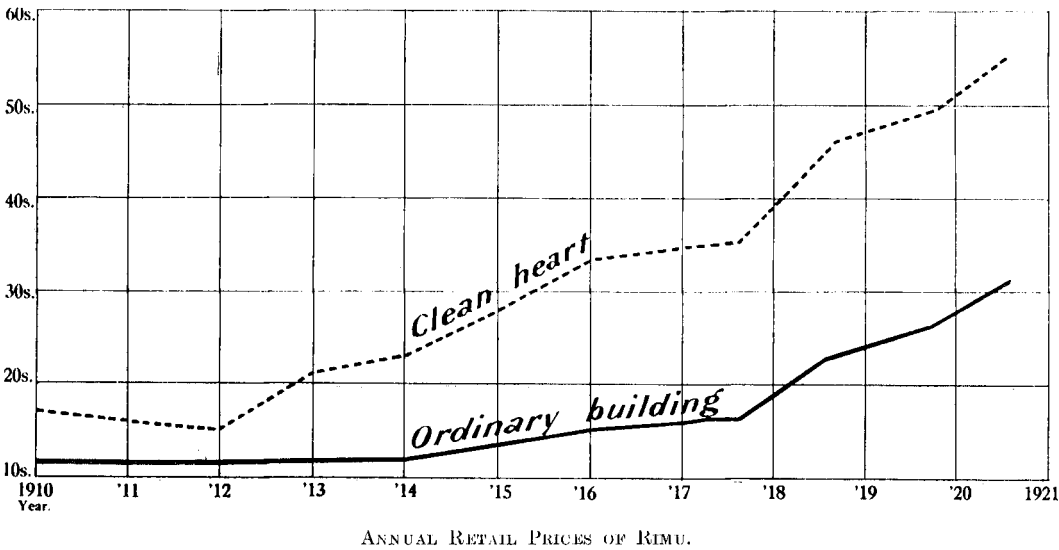
District.	Sawmill Areas.		Reservations.
	Number.	Area.	Area.
		Acres.	Acres.
North Auckland	3	8,900	..
Auckland	2	1,541	..
Nelson	1	200	..
Marlborough	2	300	..
Southland	36	8,600	23,355
Totals	44	19,541	23,355

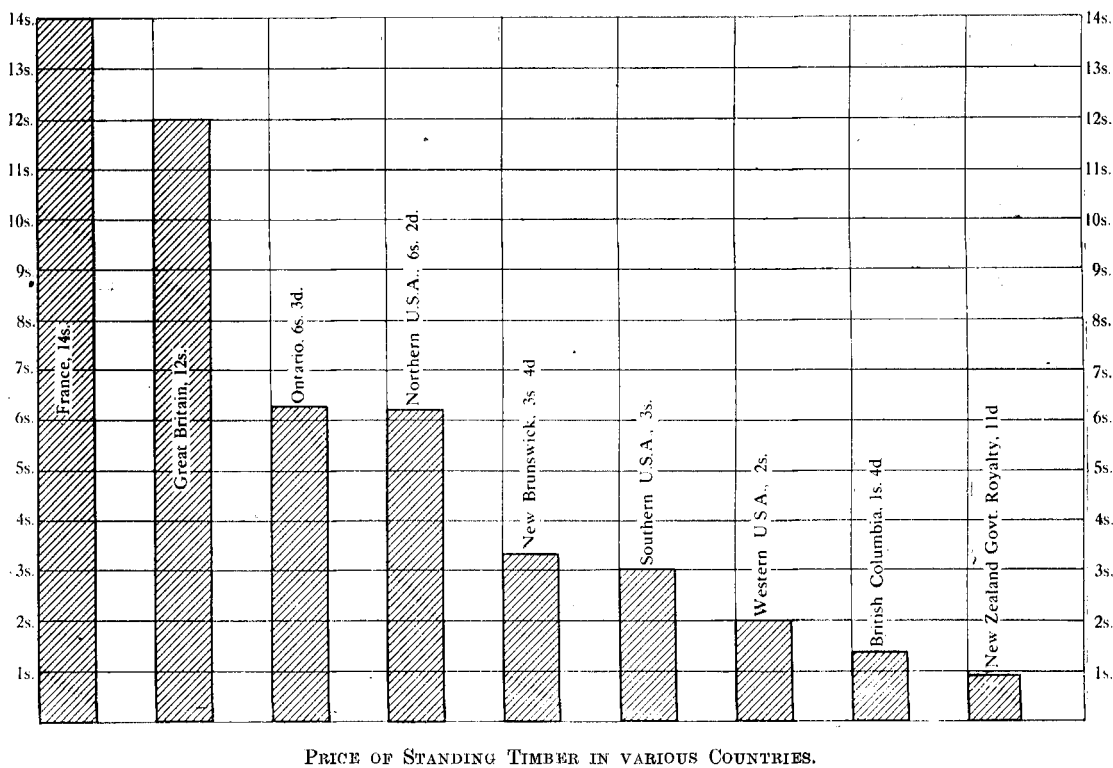
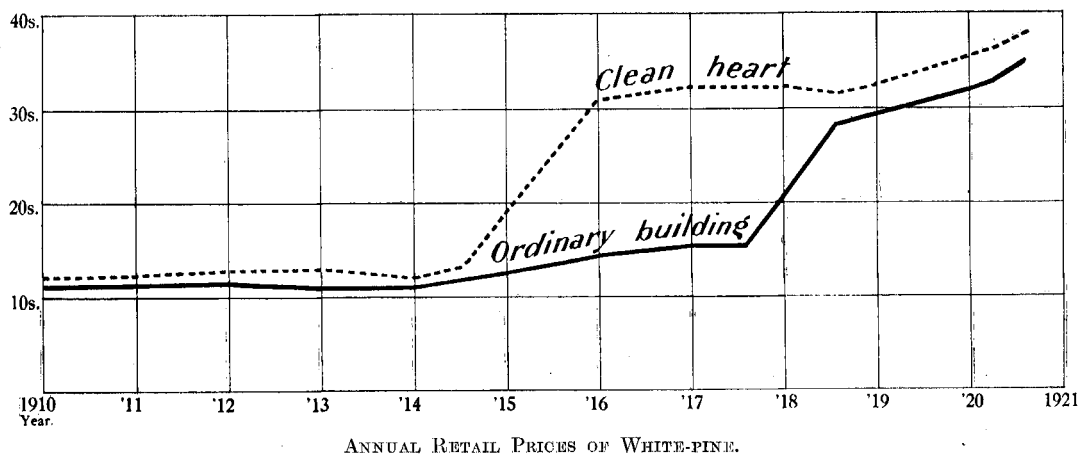
SCHEDULE 2.
Licenses issued by the Mining Wardens.

District.	Sawmill Areas.		Reservations: Area.	Splitters' Licenses.	
	Number.	Area.		Number.	Area.
Auckland—		Acres.	Acres.		Acres.
Waihi	2	800	1,880	4	80
Nelson—					
Collingwood	2	360	..	..	..
Karamea	10	3,270	1,295	..	..
Murchison	..	..	..	1	20
Westland—					
Greymouth-Reefton	30	8,687	16,988	2	25
Ahaura	12	3,699	7,216	..	..
Kumara	13	4,400	10,100	3	60
Hokitika	17	5,700	14,700	4	80
Stafford	2	800	3,000	..	..
Ross	5	1,639	4,376	..	..
Okarito	8	2,420	8,149	..	..
Totals	101	31,775	67,704	14	265

APPENDIX VIII.—TIMBER-PRICES (RETAIL). WELLINGTON.

Month.	Year.	Rimu.		White-pine.		Totara.		Matai.		Kauri.	
		O.B.	Clean Heart.	O.B.	Clean Heart.	O.B.	Clean Heart.	O.B.	Clean Heart.	O.B.	Clean Heart.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
..	1910	11 9	17 0	11 3	12 0	14 0	24 0	12 0	19 0	..	..
..	1912	11 6	15 0	11 6	12 9	14 0	24 0	12 0	19 0	..	..
..	1913	12 0	21 0	11 0	13 0	15 3	28 6	12 0	24 0	..	..
January ..	1914	12 0	23 0	11 0	12 0	16 0	31 0	17 0	..	..	..
June ..	1914	13 0	25 0	12 0	13 0	18 0	32 0	18 6	25 6	..	..
..	1916	15 0	33 0	14 6	31 0	21 6	36 6	21 0	25 6	34 0	40 0
April ..	1917	16 0	35 0	15 6	33 0	22 6	39 6	22 0	28 6	35 6	43 0
August ..	1917	16 0	35 0	15 6	33 0	23 6	41 0	23 0	30 0	35 6	43 0
August ..	1918	23 0	45 6	28 6	31 6	30 0	47 6	31 0	39 6	46 0	54 0
September	1919	26 0	49 0	31 6	34 6	34 0	54 0	33 0	42 0	49 6	58 6
March ..	1920	29 0	52 6	33 0	36 0	36 6	57 0	38 0	45 0	54 0	63 0
July ..	1920	31 0	55 0	35 0	38 0	39 6	63 0	40 0	47 6	57 0	66 0





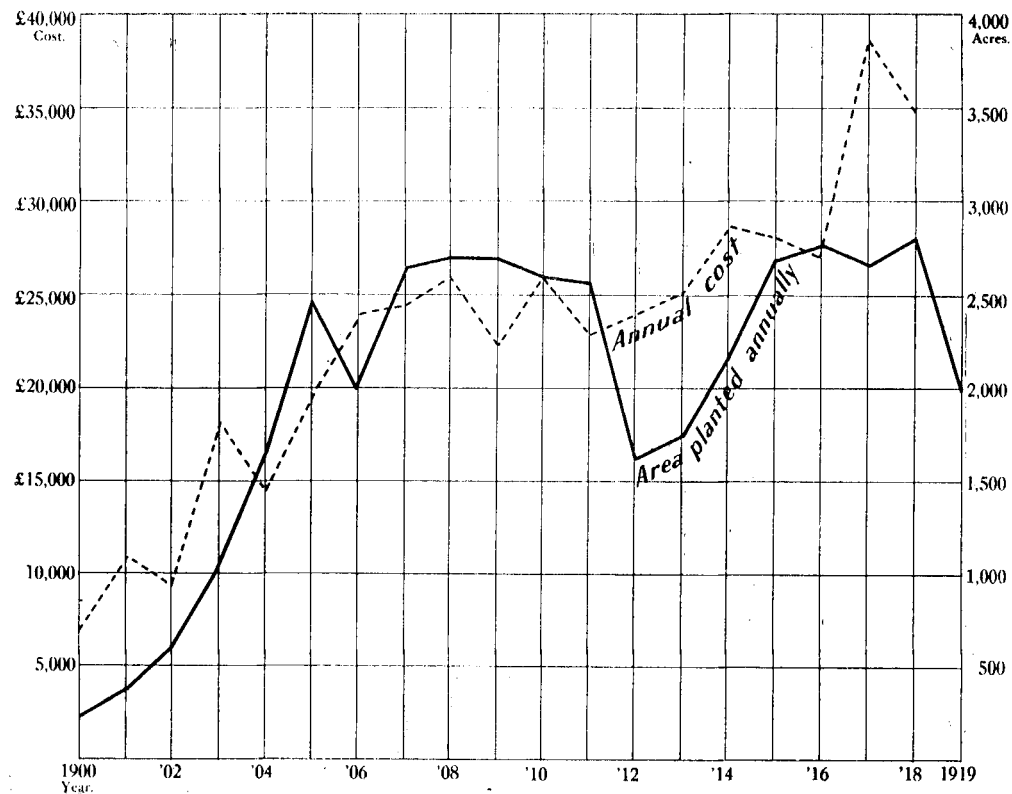
APPENDIX IX.—ACREAGE OF STATE-PLANTATION AREAS.

Plantation.	Pines.	Larch.	Spruce and Douglas Fir.	Eucalypts.	Miscellaneous.	Roads, Tracks, Fire-breaks, &c.	Land unsuitable for Planting.	Unplanted Land.
Whakarewarewa	3,137.49	2,557.80	643.31	1,468.70	159.04	514.43	1,490.23	152.80
Waiotapu ..	4,950.73	3,310.85	..	180.50	11.95	551.08	1,324.20	288.65
Kaingaroa ..	5,641.55	25.58	340.17	..	..	446.18	..	26,901.52
Conical Hills ..	1,850.00	913.00	138.50	..	632.00	138.50	..	..
Pukerau ..	555.00	..	18.00	..	..	55.00	..	..
Dusky Hill ..	270.75	234.25	93.25	..	147.50	99.25	..	..
Greenvale ..	703.00	..	3.00	..	31.00	55.00	..	4,377.00
Naseby ..	1,475.00	294.00	..	..	7.00	150.00	374.00	550.00
Gimmerburn ..	74.00	14.00	..	..	..	12.00	..	325.00
Hanmer Springs	1,409.00	1,177.00	200.50	..	100.00	150.00	381.50	250.00
Totals ..	20,066.52	8,526.48	1,436.73	1,649.20	1,088.49	2,171.44	3,569.93	32,844.97

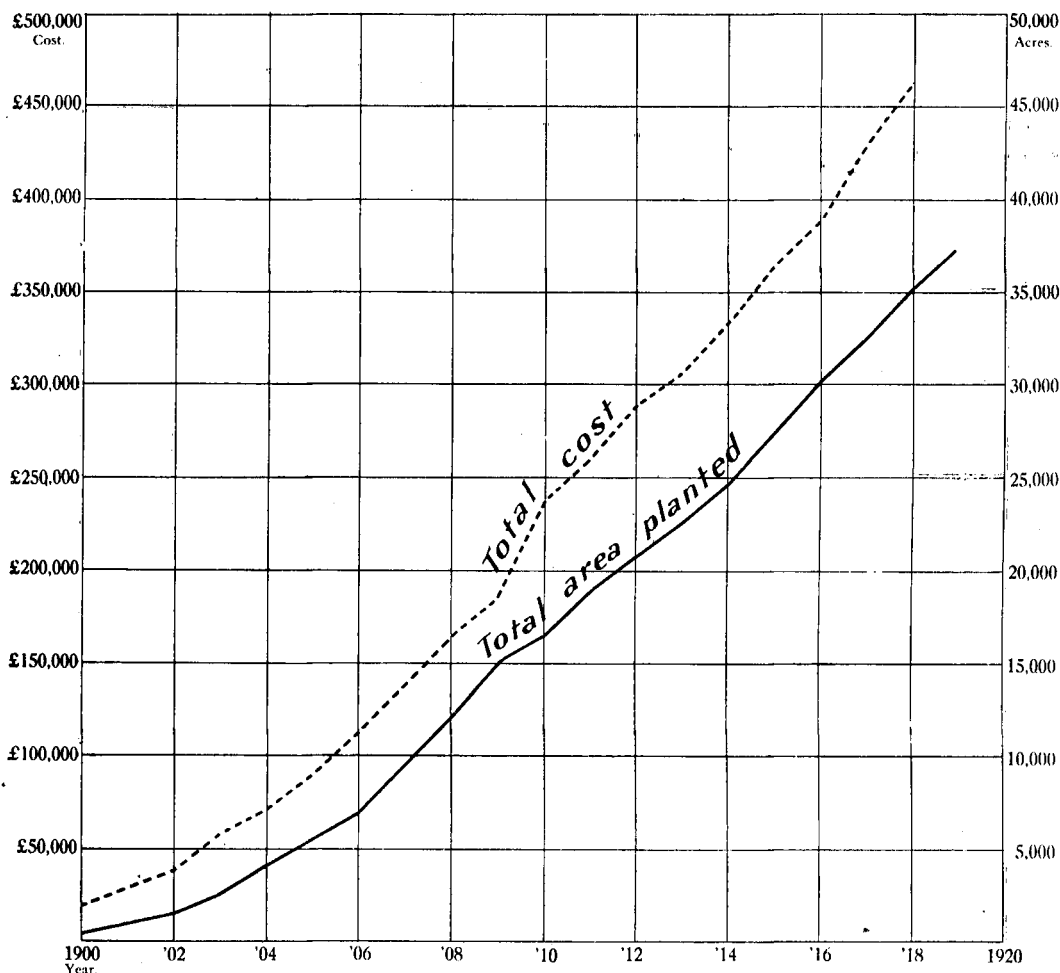
APPENDIX X.—STATE PLANTATIONS: ANNUAL COST OF PLANTING, ETC.

Year.	Area planted.	Annual Cost.	Total Area planted at Beginning of Year.	Total Cost at Beginning of Year.
	Acres.	£	Acres.	£
1900	241	6,908	474	18,913
1901	380	11,016	858	28,560
1902	620	9,329	1,438	37,619
1903	1,040	18,196	2,479	55,886
1904	1,679	14,414	4,058	70,300
1905	1,435	19,479	5,494	89,779
1906	1,992	23,901	6,810	113,680
1907	2,655	24,443	9,465	138,123
1908	2,709	26,041	12,175	164,143
1909	2,698	22,244	14,831	185,983
1910*	2,600	25,961	16,310	236,074
1911	2,566	22,690	18,870	258,764
1912	1,604	23,897	20,634	288,091
1913	1,825	25,050	22,459	304,433
1914	2,165	28,648	24,563	333,069
1915	2,677	28,029	27,240	361,098
1916	2,764	26,863	29,992	387,961
1917	2,653	38,957	32,358	427,018
1918	2,799	34,805	35,158	461,923
1919	1,972	..	37,130	..

* The large increase in total expenditure shown for this year is due to the fact that value of prison labour on plantations, &c., since their formation is included. Previous to 1910 this was not shown as an expenditure.
Cost includes all expenditure on nurseries and plantations—i.e., raising of trees, establishing, maintenance buildings, &c.



AREA PLANTED ANNUALLY BY THE STATE AND ANNUAL COST.



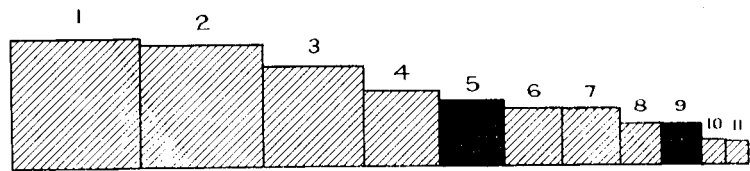
TOTAL AREA PLANTED IN NEW ZEALAND AND TOTAL COST.

APPENDIX XI.—FORESTS AND FOREST LANDS UNDER THE CONTROL OF THE CROWN.

Category.	Total Area.	Non-forested.	Forested.	Remarks.
	Acres.	Acres.	Acres.	
State forests	1,654,214	190,000	1,464,214	Includes State-plantations reservations of 71,356 acres.
Forest reserves	418,367	100,098	318,269	..
Forest reserves	103,000	50,000	53,000	Vested in local bodies.
National-endowment lands	2,356,575	151,000	2,205,575	Includes provisional State forests to the extent of 1,059,695 acres.
Crown lands under forest	4,249,832	350,000	3,899,832	Includes provisional State forests to the extent of 3,551,029 acres.
Lands for settlement under forest	..	..	66,735	..
Scenic reserves	312,076	..	312,076	Reported as containing no milling-bush.
National parks	2,785,389	719,832	2,065,557	A proportion milling-bush.
Educational endowments	1,702,488	1,552,488	150,000	The non-forested lands under lease.
Totals	13,581,941	3,113,418	10,535,258	

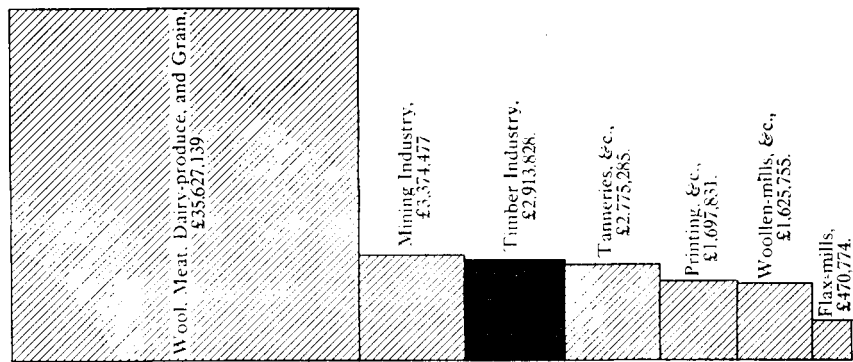
Forested lands under State control represent 9.5 acres *per capita*, and 15.9 per cent. of the total Dominion land surface.

State forests (formally and provisionally dedicated to forest management) represent 5.7 acres *per capita*, and 9.4 per cent. of the total Dominion land surface.



DISPOSITION OF LANDS IN NEW ZEALAND.

	Acres.	Percentage.
1. Area of Crown lands leased under all tenures (exclusive of reserves leased by Crown) ..	19,322,833	29.20
2. Area sold and held on freehold	17,753,624	26.80
3. Area granted under Acts without money-payments, or reserved for public purposes ..	12,092,003	18.50
4. Area of Native land	6,585,489	8.42
5. Area of provisional State forests (included in columns 3 and 7) (10 per cent. not yet gazetted)	5,119,474	7.73
6. Estimated area of barren and worthless land not included under any other heading ..	3,831,526	5.75
7. Area for future disposal (exclusive of land shown in other columns)	3,760,356	5.68
8. Estimated area occupied by roads, rivers, lakes, &c.	2,242,223	3.39
9. Area of State forests (included in column 3)	1,654,211	2.50
10. Area open for selection	704,178	1.06
11. Area of forest reserves (included in column 3)	521,365	0.79



VALUES OF MANUFACTURES OR PRODUCE FOR YEAR 1915-16.

Approximate Cost of Paper.—Preparation, not given ; printing (600 copies, including maps and diagrams), £110.

By Authority : MARCUS F. MARKS, Government Printer, Wellington.—1920.

Price 2s. 9d.]