

1886.

NEW ZEALAND.

SCHOOL OF FORESTRY, POMOLOGY, AND AGRICULTURE

(PAPERS RELATIVE TO PROPOSED ORGANIZATION OF).

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

No. 1.

Mr. W. DE G. REEVES to Mr. McKERROW.

General Crown Lands Office, Forest and Agricultural Branch,
Wellington, 15th April, 1886.

SIR,—

I have the honour to report that, according to your instructions, I visited Whangarei on the 5th March for the purpose of examining the Kioreroa Block, lately the Whangarei High School Reserve, with the view of reporting on its capabilities as a site for a school of agriculture. I called on Mr. R. Thompson, Chairman of Whangarei County Council, who very kindly offered to show me over the block. I took advantage of this offer, and rode over a large part of the land in company with Mr. Thompson.

This block of land consists of about four thousand acres, and lies about two miles south of the Township of Whangarei, with a good road running through it, cutting it into two unequal parts. That lying to the east of the road, approximately about six hundred acres, is nearly flat, with a general inclination to the north-east, where a small creek runs into the harbour. In places, mostly near this creek, the soil is of fairly good character, but the greater part would want draining before it would be much good. The draining could be easily done by means of open ditches, as there is a good fall from all parts into the creek. At the southern end of the block are some high hills covered with bush, and lateral spurs run from these hills in a northerly direction, with nicely-sheltered valleys between, having good aspects, and mostly of a good soil. Some of them, in fact, have a great deal of limestone, as the rock crops out in numerous places at the heads of the small gullies. The land generally is covered with fern and tea-tree scrub; and the soil, except in the gullies, very light and thin, lying on a cold, hungry-looking clay, which wants working well before any fair return could be obtained from it.

I should think that the land, climate, and neighbourhood were admirably suited for a school of forestry, and where experiments in the growing of the best varieties suitable to the surrounding districts of all kinds of fruits, and the introduction of new kinds, might be carried on side by side with the forestry work, as well as experiments in the best means of eradicating the numerous blights that at present are so destructive to the orchards all over the colony, and be of immense benefit to the largely-increasing body of fruit-growers.

A school of agriculture would, I think, be out of place in this district, where the conditions of farming and the climate are so different from the rest of the colony; and it would be hard work to induce pupils from other parts of the colony to undergo a course of study in a place that is suited for little else than growing fruits, tobacco, and maize. It is most important that a school of some sort should be instituted where practical training could be obtained in the best modes of raising fruit, tobacco, and numerous other sub-tropical plants, and of combating the blights peculiar to them, as there is no doubt that fruit- and tobacco-growing are destined to play a very important part in the future of farming in the northern part of the North Island.

Mr. McKerrow.

I have, &c.,

W. DE G. REEVES.

No. 2.

REPORT ON THE KIOREROA BLOCK AS A SITE FOR THE PROPOSED SCHOOL OF FORESTRY,
POMOLOGY, AND AGRICULTURE.—(T. KIRK, F.L.S.)

THIS block, which has been set apart as a site for a school of forestry (section 24, "New Zealand State Forest Act, 1885") is situate about one mile from the Township of Whangarei, the eastern extremity of the block being closely adjacent to the railway wharf.

Extent, Boundaries.—The block contains 3,891 acres, and is of most irregular outline, so that the cost of fencing will be unusually heavy. Its greatest length is about five miles from

east to west, its extreme width rather over two miles from north to south, but in one place it is contracted to about twelve chains. The north-eastern point is bounded by Whangarei Harbour. In other parts it is bounded by Native or settled lands, except along portions of its southern margin, which are defined by the Otaiko River.

Roads.—The block is intersected by the Maungakaramea Road, which divides it into two very unequal parts, the portion on the eastern side of the road being rather more than one-tenth of the whole. The old track to Maungakaramea *viâ* the Devil's Staircase, now disused, crosses the block further to the west. On the north, a road giving access from the Maungatapere Road was laid off a few years ago.

Configuration, Natural Vegetation, &c.—On the eastern side of the Maungakaramea Road the soil is covered with tea-tree and fern, mostly of luxuriant growth. In some places it is intersected by creeks, and is rather swampy. The eastern point forms a low ridge abutting on the railway, as already described. With the exception of this ridge, the portion on this side is fairly level, and most of the swampy land would be easily drained. On the northern side of the road the land rises to the south and west, and is divided into two portions by a gentle ridge running in a south-westerly direction, and obtaining its greatest altitude above the Devil's Staircase, on the southern boundary. A little to the east of the track is the highest point of the block, 896ft. The southern margin of the block is steep and broken, but is more or less clothed with forest, consisting of kauri, tawa, tanekaha, puriri, taraire, &c., of no great value as timber. Two small patches of timber occupy hollows on the eastern side of the old track, one of which—Ruarangi—containing about forty acres, is reserved, on account of its having been used by the Maoris as a burial-place. On the north-western side of the track, two wide open gullies comprise some of the best land in the block. Unfortunately, a Native reserve, Te Hiihihi, occupies the greater portion of the widest, which it pierces like a wedge. On the eastern side of the track two or three somewhat open gullies run down to the Maungakaramea Road, where they open out; but the ridges between all those gullies are of a gentle character: in fact, except in the western extremity, which is of a more broken character, and on the southern margin, there is but little land which could not be brought under the plough. Except the timbered portions already described, the western side of the block is covered with manuka and fern, 2ft. to 6ft. high, except where it has been subjected to repeated burning, to the great detriment of the surface-soil.

Quality of Soil.—Large portions of the block, especially the lower parts, consist of a poor, hungry clay, with a few inches of surface-soil, formed by decomposed vegetable matter. The clay, however, is of a friable character, and weathers down quickly when exposed to the atmosphere. In the bottoms of the gullies and hollows, and on the eastern side of the Maungakaramea Road, the soil is of better quality; but in all these places it will require the expenditure of a considerable amount of labour before it can be brought into proper order. The slopes and higher ridges on the western side are superior to the lower land, and may be considered good third-class land, especially in one or two places, where limestone comes to the surface. No really first-class land is comprised in the block. This would be of comparatively small importance were it to be the site of a school of forestry alone; but, as one object to be kept in view should be the carrying-out of experiments with sub-tropical fruits, drug- and perfume-yielding plants, &c., a few acres of good land are absolutely necessary. I am informed that at the present moment a small section of good volcanic land on the northern boundary of the block may be purchased at a reasonable price.

The position of the block is especially suitable for the site of a school, as direct access can be obtained from the railway wharf at a small cost, while it is within easy distance of the pleasant Township of Whangarei. The one drawback consists in the want of a few acres of really good land for experiments in the introduction of economic plants of a sub-tropical character; but this might be supplied at a small outlay. For a school of forestry there is the special advantage afforded by the piece of indigenous forest on the southern boundary of the block. Although the trees are of little value as timber, they would be of the greatest value for teaching-purposes, and would afford great facilities for practical work. Moreover, the block is situate within easy distance of the State forests of Maungatapere, Pukenui, Puhoi, and others, in all of which work must be carried forward at an early date. The area of the block is amply sufficient for the formation of plantations, orchards, experimental grounds, and farm, and might be made to include an arboretum sufficiently extensive to contain a specimen of every tree or shrub capable of being grown in the colony. This alone would prove of the greatest value to settlers interested in arboriculture, and would ultimately prove an attractive feature of the district.

Maungatapere Forest Reserves.—The Assistant Surveyor-General, Mr. S. P. Smith, suggested that these reserves might possibly be found well adapted for the purposes of a school, as the land is of good quality, and one or two excellent sections closely adjacent might be added for experimental purposes if desired. I therefore deemed it advisable to examine them for the purpose of ascertaining their capabilities. The reserves are situate nearly fourteen miles from Whangarei, and are intersected by the Kirikiri Stream. Inclusive of three small irregular areas on their margins, they comprise about nineteen hundred acres. Much of this area is covered with timber, a considerable portion of which is kauri of very good quality. Taraire, tawa, puriri, walnut-leaved cedar, &c., form a mixed bush on other parts of the reserves. Many acres of

timber have been destroyed by fire, and some portions are covered by fern or scrub. Most of the land is of good quality. In the immediate vicinity a section of good volcanic land, comprising about seventy acres, would be available for experimental purposes, for which it appears specially adapted, the lower portion being level, the upper part forming the base of a low hill. At present it is covered with forest, which, however, is of a light character. The open land in the reserves might be made available for farming operations, planting, &c., with but little delay. Altogether, the site is well adapted to the purposes of a school of forestry and agriculture. It is approached by a fairly good road, which is now undergoing improvement; but the position is not equal to that of the Kioreroa Block. As it is situated nearly fourteen miles from Whangarei railway-station, the cost of carriage would form a serious item in the working expenses of the school.

A site at the Bay of Islands appears to offer certain advantages, especially with regard to experiments in the introduction and testing of sub-tropical economic plants. It is, however, limited to 250 acres, which would not be sufficient for the purpose of a joint school of forestry and agriculture. I regret to say that, owing to the brief space of time at my disposal, I was unable to ascertain its capabilities.

No. 3.

Mr. T. KIRK to the Hon. J. BALLANCE.

General Crown Lands Office, Forest and Agricultural Branch,
Wellington, 9th June, 1886.

SIR,—

In compliance with your instructions, I have the honour to submit a memorandum on the organization of a school of forestry, pomology, and agriculture. I hope that the addition of pomology to the arts named in your instructions will meet with approval. I have endeavoured to show a way of rendering the institution self-supporting within a reasonable period, and would request particular attention to this portion of the scheme, even if you should consider other parts of the plan too expensive to be adopted at present. The proposed plantations would realize a permanent income of £600 per annum within eight years. Should it be considered desirable on grounds of economy, the school might be started with a small staff—say, general manager, forester and gardener, and superintendent of farm-labour. This course could not be recommended, as it would be impossible to turn out good foresters, fruit-growers, or farmers with such a limited amount of theoretical teaching. The experiment has been tried in Melbourne with a school of agriculture, where it is stated to have proved a costly failure.

I have, &c.,

T. KIRK,

Chief Conservator of State Forests.

The Hon. J. Ballance.

MEMORANDUM on the Organization of a SCHOOL of FORESTRY, POMOLOGY, and AGRICULTURE. By T. KIRK, F.L.S.

So far as the Kioreroa Block is concerned, the 24th section of "The New Zealand State Forest Act, 1885," provides that the site shall become vested in the Commissioner of State Forests on the opening of a school of forestry and agriculture on the block. It is therefore necessary in the first place to consider the formation of either joint or separate schools of forestry and agriculture.

In a report on the suitability of this block for the purposes stated I have pointed out the great advantages arising from its position, specially considered with regard to forestry. Its accessibility, and the varied character of its surface, with the variety of surface-soil, afford equal advantages for the establishment of a school of agriculture, although the soil is not of the best quality. The most serious drawback is the absence of a few acres of really first-class soil. This, however, more directly affects the experiments which it is proposed to carry on in the culture of sub-tropical economic plants, but is of much less importance from an agricultural point of view. It is, moreover, a defect which could be remedied at a small outlay.

The rapid development of fruit-culture in the colony, and the important position which it is fast attaining as a leading industry, render it most advisable that its pursuit should be encouraged as far as possible without undue interference on the part of the State. It is therefore proposed that the school should afford facilities for acquiring a comprehensive knowledge of pomology, in addition to forestry and agriculture. Instruction in this important branch of industry may be given without any increase in the cost of the teaching-staff.

With regard to the formation and characteristics of soils, their working and management, drainage, &c., teaching would be identical in all the branches. So also, to a certain extent, with the nature and requirements of plant and animal life, animal and vegetable physiology, the general teaching would be identical, although important differences would occur in detailed teaching. Up to a certain point, therefore, the general course of teaching would be practically the same in all three subjects—a matter which will be found of great assistance in commencing work.

At the outset it ought to be laid down that no student should be admitted who fails to pass an entrance examination based upon the sixth primary-school standard. Students should be

between sixteen and twenty-one years of age on admission. Provision should be made for resident and non-resident students. Special provision should be made for older students, especially for those who have taken a university degree and may desire to acquire a technical knowledge of either forestry, pomology, or agriculture; but all students should be required to go through a course of practical work.

The object of the school is to teach the principles and practice of forestry, pomology, and agriculture. It will be necessary to divide the work into two courses—1, forestry and pomology; 2, agriculture. Students should not be permitted to enter for both courses at the same time. The mode of instruction to be—(a) lectures, (b) experiments and analysis in the biological and chemical laboratories, (c) practical work in the plantations, forests, orchard, garden, and farm.

The Staff.—Teaching.

1. *A General Manager*, who should have sole charge of the institution, subject in all respects to the approval of the Commissioner of Forests, and should be held responsible for the maintenance of discipline and the efficient working of the school. He must be thoroughly acquainted with the theory and practice of agriculture, and be able to lecture on the subject. He should have had experience in the management of a teaching-staff and in the control of students.

2. *Biological Lecturer*.—The biological lecturer must have a theoretical and practical knowledge of botany and zoology, with a detailed knowledge of ordinary forest- and fruit-trees, agricultural plants, especially of grasses and forage-plants, both Native and introduced. It would be an additional advantage for him to possess a knowledge of the diseases of plants, whether constitutional or parasitic, more especially those of a fungoid character, and with the chief external and internal parasites of farm-animals. He would be required to take charge of the biological laboratory and museum, also of a portion of the experimental grounds, and to carry out such experiments as may from time to time be deemed advisable.

3. *The Chemical Lecturer* must be well acquainted with inorganic and organic chemistry, more especially as applied to the products of the forest, the orchard, and the farm. He will be required to lecture on chemistry and physics; to take charge of the chemical laboratory, and carry out such inquiries and experiments as may be required.

4. *The Lecturer on Forestry and Pomology* must be acquainted with the theory and practice of these branches, and competent to give directions to the forester. He should take charge of the plantations and orchard, also the larger portion of the nurseries and experimental grounds.

5. *The Mathematical Lecturer* will be required to teach geometry and trigonometry as applied to land-surveying; levelling, mechanics, and hydrostatics; also book-keeping for the forest, farm, and orchard. The practice of surveying and levelling must be taught in the field.

A Porter, whose business it should be to keep the lecture-hall, class-rooms, laboratories, library, lecturer's room, and offices in proper order, and to light fires, lamps, &c.

The Staff.—The Plantation, Orchard, and Farm.

A Gardener and Forester who must also be well acquainted with fruit-growing. He must be capable of carrying out experiments and instructing students in the plantations and orchards.

A Dairyman to take charge of the dairy and the general supervision of the stock.

When the school is well under way it might be found practicable to give a limited amount of instruction in carpentry and smith's work as applied to farm and forest purposes.

Rough Statement of Accommodation required in the School-buildings, Houses for Lecturers, &c.

Residence for manager (eight rooms); day-rooms and dormitories for resident students, dining-hall for students, kitchen, lecture-hall, two class-rooms, biological laboratory and museum, chemical laboratory, reading-room and library, manager's office, lecturer's room, porter's room, &c.; two houses for lecturers (six rooms), two houses for lecturers (five rooms), three cottages—for forester, farm-manager, and dairyman (one six rooms, two five rooms), garden-shed, tool-house, and packing-room. I believe the above might be erected for £4,000; but it is desirable that a professional estimate should be obtained.

Farm-buildings, &c.

Stabling for horses, milking-shed, cattle-yards, &c., piggeries, implement-shed, dairy and cheese-room, superintendent's office and seed-room, granary.

In compliance with the suggestion of the Commissioner of State Forests, the salaries for lecturers on forestry and on mathematics are omitted in the following estimate for the first year, their work being discharged by the biological and chemical lecturers respectively: Manager, with house and profit on board of students, £500; biological lecturer, with house, to lecture also on forestry and fruit-culture, £300; chemical lecturer, with house, to lecture also on mathematics, £250; forester and gardener, with house, £125; dairyman, £100; porter, £80: total, £1,355. The salaries of the lecturers are too low for properly-qualified men; but this point will be referred to elsewhere. It is assumed that a superintendent of farm-labour may be dispensed with for the first year.

The annual cost of maintenance will be greatly increased if it be determined to provide the students with any great amount of luxury. In my opinion each student should be required

to keep his bed-room and study in proper order, to clean his own boots, to wait at table in due course, and discharge other duties of a kindred nature. Discipline of this kind would involve no real hardship, and would foster a healthy spirit of self-help. Settlers of restricted means entertain the idea that the amount of attention sometimes paid to students at agricultural schools tends to render them dissatisfied with their homes, and unfits them for the plain homeliness of a settler's life. Any course tending to produce this feeling should be avoided as far as possible. If a large staff of waiters and attendants has to be maintained the fees must of necessity be high, which would prevent struggling settlers from taking advantage of the facilities afforded by the school. If, on the other hand, the students are required to wait upon themselves, as the majority would have to do in their own homes, the fees need not be higher than would be sufficient to cover the cost of board, the student's labour being considered to some extent an equivalent for the cost of teaching and the use of apparatus.

Should it be determined to commence with a school of forestry and pomology alone, the cost of preparation and maintenance would be greatly reduced. The manager should, in that case, be able to lecture on forestry, pomology, and chemistry, and to take charge of the chemical laboratory. The salaries of farm superintendent and dairyman, also the heavy outlay for farm, buildings, horses, stock, and implements, would be saved, as well as the large amount that would be required for preliminary labour, drainage, &c., on the farm.

Revenue.

It is obvious that if the fees paid by students are not to exceed the actual cost of their board, the entire cost of teaching and maintenance must be defrayed by the Legislature until such period as the plantations, orchard, and farm can be made to contribute to revenue. Under these circumstances it seems only fair that the County Council of the district should be requested to grant an annual subsidy from the county rates, say, for five years, on account of the direct benefit derived by the district from the large initial outlay and subsequent annual expenditure, and still more from the advantages that will result from improvements in the processes of agriculture and pomology through the district.

After the end of the second year the farm may be expected to return some small profit, which would increase yearly; but, until an advance takes place in the market-value of agricultural produce, the income from this source will be but small at its best, as the land, being of poor quality, will require a large expenditure for fertilizers to render it profitable.

At the end of five years the orchard should yield a profit, which would increase year by year, the amount depending upon the area laid down in fruit-trees. After making all fair deductions on account of unfavourable seasons, the average net profit on a good orchard, say, eight years after planting, should not be less than £10 per acre, and would in reality be much larger. The orchard should be sufficiently extensive to yield a net return of £1,000 per annum.

About the same period—five years—will be required before any return can be obtained from the plantations. At the close of the fifth year the first profit might be expected from wattle-bark. After the seventh year plantations of black or golden wattle would return a minimum average profit of £2 per acre, after deducting all expenses. On 500 acres this would give a clear annual return of £1,000. Timber, also, must not be lost sight of as an item of revenue, although a lengthened period must elapse before it can be rendered available. Bearing in mind that the average price of timber in the colony must advance with the diminution of the supply of kauri, I estimate the return from 100 acres of ripe jarrah would amount to £10,000, which of itself would afford a substantial nucleus for an endowment fund. It is, perhaps, in this case, unfortunate that with the choicest products of forestry the interval between sowing and reaping is but rarely compassed by the average duration of human life, although the ultimate return is none the less certain.

Other items of revenue would probably be afforded by the growth of oil-yielding eucalypts, from the thinnings of the plantations, mint, and other drug- and perfume-yielding plants, or by certain economic plants, as the earth-nut, which is largely imported into New Zealand. Some of these might be cultivated on a large scale.

Several years must elapse before the entire block could be utilized for purposes directly connected with the proposed school. I am assured that a large portion of the area could be let easily at £1 per acre if laid down in grass. It might be found advantageous to adopt this plan with 400 or 500 acres, which would tend to the improvement of the land.

The question of profits to be derived from farm-produce can only be properly dealt with by a competent person; but I am fully convinced that the sections of forestry and pomology would become self-supporting in a few years.

School of Pomology.

The proposal to establish a school for fruit-culture, so far as I am aware, is entirely new. It may therefore be expected that objections will be raised against it, simply on the ground of its novelty. It is consequently desirable to direct attention to one or two of the chief advantages to be derived from its successful working. The proper training of youth as fruit-growers necessarily includes those matters generally recognized by intelligent settlers as essential to success in fruit-cultivation—the preparation of the soil, and its adaptation to the requirements of the particular kind of plant in question; planting, as distinct from “sticking a plant in the

soil;" heading down in the early stages; summer and winter pruning, &c.; but these subjects, great as their importance may be, are less important than others which, at present, have received but little attention.

Of these, one of the most important is the selection of suitable stocks. Except in a single direction this subject is entirely neglected in the colony. Its importance is capable of easy illustration: a few years ago apple-cultivation was in danger of becoming unprofitable in all the Australian Colonies owing to the ravages of the American blight; when it was discovered that the Majetin, Northern Spy, and a few other kinds were rarely attacked by the insect, and, even when attacked, they suffered but little. This led to experiments with these blight-resisting kinds as stocks for more susceptible varieties; and the experiments proved successful. The varieties grafted on the blight-resisting stocks were in many cases entirely exempted from attack, or the attack was so slight that no serious injury resulted. The roots of blight-resisting stocks are never attacked by the aphid. It is uncertain whether the credit of this discovery must be given to Victoria or New South Wales; but New Zealand may claim the credit of improving the process by the method of double-grafting now generally adopted by the best nurserymen in the colony. This not only enables the blight-proof stock to be propagated cheaply and rapidly, but increases the power to resist the attack of the insect. Strange to say, this discovery, which is of the greatest advantage to fruit-growers, is not appreciated at its real value; and orchards may still be found in which the trees are covered with the white, woolly patches of the insects, forming plague-spots in the district in which they occur. The peach affords an instance of almost equal value. Had the ordinary European plan of working this fruit on the Mussel stock been adopted in the Australian Colonies we should have escaped the terrible destruction which has overtaken the trees during late years, and they would have been able to endure unfavourable seasons without any serious results. No more striking instance of this could be required than was to be seen in an Auckland nursery, where the only trees in good health, not excepting seedlings a few inches in height, were two imported plants worked on the Mussel stock. Every English nurseryman is aware of the importance of adopting the Mussel stock for the peach; but it has been neglected by colonial growers, with the lamentable results which have for some years been patent, and to which they must always be exposed, notwithstanding any partial recovery that may be manifested during an unusually favourable season. The apricot affords another illustration. It is often unprofitable, and the branches are apt to die off—evils which would be promptly remedied by the adoption of the proper stock. Even amongst apple-growers the question of the best kind of blight-resisting stock often causes warm contention. The solution of the difficulty rests in the simple fact that one kind is better adapted to certain varieties than another; but problems of this kind can only be decided by observation and practice. The same conditions are found with regard to the pear, and, in a less degree, the plum; and at the present moment it is not too much to say that the cultivation of the orange in the colony is jeopardized by neglect of this prime factor in successful fruit-growing. The great value of this subject must be my excuse for insisting upon the advantages to be derived from careful theoretical and practical teaching with regard to its absolute necessity.

Another important subject, which in some districts is crippling the fruit industry and reducing the yield to a point which affords no profit, is the prevalence of fungoid and insect pests. I need not insist here upon the extent of the injuries arising from these causes, but will direct attention to the advantages to be derived from a course of training that would enable the fruit-grower to recognize the different kinds when they make their first appearance, and teach him the lines upon which they can be most successfully encountered.

A subject entirely neglected by colonial fruit-growers at present, but which must receive a large amount of attention before New-Zealand-grown fruits can take their proper place in the markets of America and Europe, is that of packing. The wealthy cities of Great Britain, the Continent of Europe, and the United States will be the most profitable customers of colonial fruit-growers; but not until they have learned to grow the best kinds, and to pack them in such a manner that injury during their transit will be reduced to a minimum. Other advantages might be mentioned; but those already stated are sufficient to indicate the benefit to be derived by establishing a school of pomology.

Although the orchard must be looked upon as a source of revenue, and must therefore be of large extent, it will scarcely be advisable to plant the entire area to be devoted to fruit-growing at once. Probably to lay down five acres in fruit-trees will be found as much as can be accomplished this season, and the area should be extended yearly until 100 acres are devoted to fruit-growing. After the second year most of the stocks should be grown on the school reserves, and grafted or budded by the students. This would reduce the cost of formation to a minimum, and give the students greater interest in their work. Every year the newest varieties should be introduced from Europe and America, and their adaptability to the climate of New Zealand properly tested. The school would thus become, not merely an institution for training fruit-growers, but a most efficient means of diffusing pomological knowledge and assisting an important branch of industry.

The Experimental Gardens.

These will prove valuable adjuncts to teaching in forestry, pomology, and agriculture alike, while their value in connection with the introduction and propagation of sub-tropical plants of an economic character, new varieties of pome-fruits, and other plants, yielding drugs, per-

fumes, fibres, material for the manufacture of paper, and numerous other kinds, cannot easily be overestimated. Grasses and forage-plants should receive special attention.

But it is not sufficient to introduce the plant or even to propagate it; its adaptation to the climate of New Zealand and its capabilities for profitable cultivation will require to be carefully ascertained before an accurate opinion of its value can be arrived at. A plant that may be profitably cultivated at the Bay of Islands or Whangarei may prove useless on the Canterbury Plains. A plant capable of being grown with profit in a limestone soil may be worthless on the deep, loamy soil of other districts. It follows that experimental gardens may be advantageously established in other portions of the colony. I look upon this as affording one of the cheapest and readiest means of increasing the resources of cultivators of the soil, and, with the gradual establishment of the permanent nurseries of the Forest Department, hope to propose the appropriation of an annual sum for the maintenance of small experimental gardens in the Eketahuna District in the North Island, and in the Oamaru District and the Winton District in the South Island. Each of these gardens would have its special kind of work, which would to some extent be determined by climate and situation. The Whangarei garden would be the chief centre for the introduction and establishment of economic plants of a semi-tropical character, Mangainatoko or Eketahuna and Winton for grasses and forage-plants, Oamaru for plants yielding oils and perfumes; but in no case would work be restricted to these groups. These gardens would also afford the means of supplementing elementary instruction in the general principles of plant-cultivation by a certain amount of practical teaching. In this way they would serve the purpose of preparatory schools of pomology and agriculture; and the small expenditure necessary for their maintenance would be vastly outweighed by the direct advantages afforded by their establishment.

Elementary Instruction.

Instruction in the nature and characteristics of plants and animals and the processes of agriculture might be imparted in primary schools by teachers specially qualified for the work, and, given effectively, would form an excellent groundwork for the higher teaching of the school of forestry and agriculture, especially if the elementary teaching could be supplemented by practical teaching in local experimental gardens, as already suggested. It is not by any means necessary that all the children in any given school should pass through a course of this kind. The teaching should be restricted to the senior classes, and might be given by itinerating teachers, who should have charge of all schools within a given district, and should give at least two lessons per week to each class. Teaching of this kind must be accompanied by the examination of living objects by the class as far as possible. Many of these would be easily obtained, as the ordinary weeds and cultivated plants of the farm are to be found in all country districts.

In this way it would not be difficult to impart a large amount of knowledge respecting the uses, habits, and general characteristics of the ordinary fruit-trees and the plants of agriculture as well as of the chief insects which attack plants and animals. But the teaching should be carried further: it would not be difficult to impart a knowledge of the general structure of plants and animals, and to some extent of their anatomy and physiology. The chief facts connected with the germination of seeds, the mode in which plants and animals obtain their food, the processes of assimilation and development, may be stated in such a manner as to interest children, and made a grand means of developing their faculties of observation and judgment. And in the case of many scholars this would evoke a direct and lively interest in the processes of farming and gardening. Even if this special instruction were not carried to a higher grade, the development of the power of observation that would necessarily ensue from thorough teaching would be of great benefit to the scholars, whatever might be their subsequent walk in life, while it would be of special value to those destined for agricultural pursuits, as they would enter upon their life-work with an intelligent and appreciative knowledge of its chief processes. To what extent this could be aided by adopting the series of lesson-books on agriculture now in use in Irish schools I am unable to judge; but it is clear that the special knowledge obtained in the primary schools would be of the greatest value in facilitating the progress of those scholars who might enter the school of agriculture.

The kind of elementary teaching here described might be effectively given in many cases by female teachers, and would afford a new opening for females gifted with any special aptitude for the work, and prepared to undergo the necessary training.

Scholarships.

In order to encourage the acquisition of elementary knowledge in the cultivation of the soil, it is desirable to offer a number of free scholarships in the school of forestry and agriculture for competition amongst scholars in the primary State schools and in private schools of similar grade. Each scholarship should be tenable for two or three years, according to the period adopted for the course, and its yearly value should not exceed the actual amount of the boarding-fee, probably £35 per annum. The cost of travelling should be borne by the parents or friends of the successful competitor. The number of scholarships should be six for each Island, which should be allotted to the different educational districts as nearly as may be in proportion to the number of scholars; so that in some cases it would be necessary to unite certain small districts for this purpose. It is desirable that the advantages to be obtained from these scholarships should be diffused over the widest possible area, and in order to carry out this

view it is absolutely necessary that not more than one scholarship should be held in any given district.

The scholarships should be awarded on a competitive examination based on the Sixth Standard of the Education Department, with the addition of two short papers on the chief facts of animal and vegetable life and structure. The examination should be conducted by the Education Department, subject to the approval of the papers by the Commissioner of State Forests.

The annual cost of the twelve scholarships would depend upon the fees charged for board, &c. If these are fixed at £40 for each student, the total would be £480. With the progress of the school means may be found to provide a scholarship for each district every year; but this could not be done for less than £1,400 if a three-years course be adopted; £960 if the course be restricted to two years.

I have already pointed out that the salaries of the chief members of the teaching-staff are too low. It seems advisable to refer to this subject at greater length. The knowledge and qualifications required for the manager and biological lecturer more especially are in each case of a varied character, and but rarely possessed by one individual. It will be found an extremely difficult matter to obtain a manager versed in the theory and practice of agriculture, and possessing the power of imparting that knowledge in a pleasant and attractive manner. The possession of knowledge does not necessarily imply the possession of teaching-power, still less does it imply the faculty of organization and discipline, united with that feeling of sympathy without which other qualifications lose half their force. A biologist capable of performing really good work in connection with a school of forestry and agriculture must possess not only an acquaintance with the form, structure, and physiology of animals and plants, but he must have acquired an extensive detailed knowledge of the habits and peculiarities of those groups of animals and plants which are especially the charge of the forester, the fruit-grower, and the farmer. It is beyond the scope of our present university training to afford this special knowledge, which can only be fully attained by a lengthened experience. To attempt to impart a mere book-knowledge of any branch of natural science would be little better than a farce. At the same time, I fully believe it would be advisable to appoint the manager and lecturers at the salaries named, on the understanding that as soon as the institution becomes self-supporting the salaries should be increased.

With the object of obtaining a revenue from the Kioreroa Block for the support of the school at the earliest date, I have to make the following recommendations: 1, To lay down 250 acres in wattle plantations, £406; 2, to lay down four acres in ordinary fruit-trees, and one acre in oranges, lemons, and limes (the soil to be trenched three spits deep; the orchard to be protected by shelter-belts), £175; 3, to plant fifty acres of jarrah, of which one-year-old plants may be purchased at a cheap rate, £75; fencing, say 420 chains, at £50 per mile, £263; freight and contingencies, £20: total, £934. Estimated cost of planting as proposed, £934; estimated cost of cottage for foresters, shed, tool-house, seed-room, &c., £260: total, £1,199. Maintenance for nine months—Forester, salary, £94; labour in nurseries, &c., £100; tools, contingencies, &c., £25: total, £219.

Wellington, 9th June, 1886.

APPENDIX.

Classification of Students adopted in the Agricultural College, Roseworthy, Adelaide, under the Charge of Professor Custance.

Department A.—Practical students, who will be required to work regularly on the farm. A portion of each day will be devoted to instruction in the college. Students physically unable to work on the farm cannot enter in this department.—£50 per annum.

Department B.—Science students, who may devote themselves chiefly to the sciences in connection with agriculture, farm-work being voluntary, though no student will be qualified for the college certificate who is unable to satisfy the examiners that he has sufficient practical knowledge to render him competent to perform the various farm operations in a good and workmanlike manner.—£70 per annum.

Department C.—Working students can be received, who will be required to work all day on the farm, receiving instruction in agriculture only each evening.—£25 per annum.

Out-Students.—Settlers wishing to attend lectures and classes at the college will be received as non-resident students.—£20 per annum.

The fees stated do not include books, apparatus, or laundry account. Students are paid for their work on the farm at contract-rates where possible; if by time, at 3d., 4d., or 6d. per hour. A quarter's notice is required prior to the removal of a student. The course of study extends over two years.

NOTE.—The college was opened 3rd February, 1885. The present number of students is twenty-eight. The salary of the principal is £800 per annum, with house rent-free.

[Approximate Cost of Paper.—Preparation, nil; printing (1,650 copies), £5 7s.]