1917.

NEW ZEALAND.

BOARD OF AGRICULTURE

(REPORT OF WORK FOR THE TERM OF ITS OFFICE, 1914–17).

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

REPORT.

Board of Agriculture, Wellington, 14th May, 1917.

The Hon. Minister of Agriculture, Wellington.

SIR,—

The term of office of the first Board of Agriculture expired on the 28th ultimo, and although the order of reference makes no mention of their submitting a report, either yearly or at the end of their term of office, on the work they have performed, yet they deem it desirable that one should be furnished to you. Such a report must necessarily, at this juncture, cover the whole of the Board's work since their first meeting in June, 1914, but they think that in future years it would be preferable to submit a yearly report to you. The Board thank you for the intimation conveyed in your letter of the 2nd March last to have their annual report incorporated with your own and that of the Department. They also hope that you will see your way to have it circulated amongst the various agricultural and pastoral associations and societies. These, as you are aware, recommend to His Excellency the Governor for appointment to the Board eight of the twelve members provided for in the Board of Agriculture Act of 1913, and one association in particular has expressed a desire to see an annual report of the Board's work. The Board have already presented one report on some of their work to the Council of Agriculture, which was printed with the Council's report of its annual conference held in July, 1916, and the report now submitted to you includes a large number of the matters covered by that report.

NOXIOUS WEEDS.

The question of noxious weeds has been dealt with at great length and in various ways, and the Board have gone to great trouble in getting the views of those interested. We have, however, compiled returns, and will be in a position shortly to make a report upon it. During the past year we devoted considerable time to the subject. An effort was made to obtain information as to the worst weeds in the different centres of the Dominion, and the best methods that had been devised to cope with them. There was a very fair response to a circular that was sent out, and we hope that the information collected, which is somewhat in the nature of a "weed census," will be found useful in dealing with this very difficult problem.

Reports from Mr. Edwin Hall, one of our members; from Mr. E. Clifton, late Director of Fields and Experimental Farms; and from Mr. Cockayne, Biologist of the Department of Agriculture, dealing with the subject, were drawn up (copies of which are appended), and a special round-the-table conference of the Board and the officers of the Department interested in the question was held, at the close of which it was decided to set up a committee to formulate the various amendments to the Noxious Weeds Act that had been suggested, with the view of getting an amended Bill introduced into Parliament.

We have also circularized the various Education Boards in the Dominion asking them to take steps to encourage scholars to make collections of noxious weeds, and to promote a closer knowledge of weeds amongst the pupils by placing on the schoolroom walls coloured illustrations of the worst weeds in the district.

It was also suggested that the Department should issue a leaflet dealing with the best agricultural and economic methods of checking and reducing the growth of such weeds as Californian thistle, blackberry, ragwort, gorse, &c.

Improvement of Seeds.

The important question of the improvement of seeds was fully gone into by the Board, and we recommended that steps should be taken to initiate a weed survey; also to prevent the dissemination of unclean seed by the enactment of a Seeds Bill on similar lines to those that had been adopted by the Australian Commonwealth and by several of the States of North America to stop the sale of unclean seed. As not only farmers, but also merchants, were interested in the question of the Seeds Sale Control Bill, it was agreed that it was only fair that the Bill should be sent to them as well as to farmers for their consideration, and a recommendation to this effect was accordingly sent you.

Pastoral Lands.

The improvement of pastoral lands was discussed at some length, after we had had the advantage of hearing an interesting paper in connection with it read by Mr. W. D. Hunt, one of our members, who has a large knowledge of the subject. The following resolutions were subsequently passed and sent on to the Hon. Minister of Lands:—

"(1.) That the deterioration of these pastoral runs is largely caused by the tenure under which they are held.

"(2.) That if the tenure was freehold the owners of the land would very soon find out the best way to improve them, and in most instances would do so without any further action of the Government.

"(3.) We therefore recommend that the land should be offered for sale.

"(4.) That the areas in which the land is offered should be such as, having consideration to a reasonable limitation of areas, would enable the owner to have a sufficient number of sheep (having regard to the hazards natural to high country) to allow for losses and yet ensure an income from the investment of his capital. Further, that in cutting up the area regard must be had to the height of the country, the class of land, and the situation."

A considerable amount of experimental work has already been done by the Department in connection with this matter, and some success achieved so far as regrassing the runs is concerned, although there has been no attempt to grant the freehold of the pastoral lands.

Grassing the Taupo Country.

In regard to the question of grassing the Taupo country, which arose from a paper read by Mr. J. A. Pond, F.R.G.S., at the conference of the Council of Agriculture held in 1914, inquiries from the Lands Department showed that it recognized the importance of this matter, and the Board hope that all that is practicable will be done by experiments to ascertain the most satisfactory treatment of that class of land. A map supplied to the Board by the Lands Department shows the enormous area yet to be dealt with on the Central Plateau. The unquestionable success of many of the experiments which have been undertaken in reclaiming what was thought at one time to be waste land and bringing it into cultivation with the assistance of manure and clover makes this question one of moment, as there is such a large area which could be made suitable for settlement.

Sand-dunes.

The question of planting the sand-dunes has received our consideration, and we had a valuable paper on the subject, giving full information as to what had been done in other countries, from Mr. E. Phillips Turner, of the Lands Department. The Board recommended the Minister of Lands to establish a small experimental nursery alongside the sand-dunes in the Rangitikei district, but this has not been acceded to on the score of want of funds for that purpose. It might mean the expenditure of £100, but if given effect to the trees would be ready when money was available to plant the dunes. Already there has been considerable success in planting, but there is a great tendency to curtail the area which is necessary to properly protect the surrounding land from the encroachment of the sand, and we would again point out that the sand-dune area of New Zealand, which Dr. Cockayne has reported to be of the extent of 314,000 acres, should be reserved for planting as soon as money is available.

Experimental Farms.

The members of the Board personally have visited the various farms under the control of the Department of Agriculture, and, after long consideration of the position, drafted the report which is now in your hands.

Experimental Plots.

The Board had several discussions with Mr. Pope, Secretary for Agriculture, with Mr. Brown, Director of the Fields Division, and with Mr. Aston, Agricultural Chemist, regarding experimental plots, and the importance of closer co-operation between the Education Department and the Department of Agriculture was fully discussed.

At the Board's request the Department of Agriculture has made a start with agricultural and pastoral demonstrations on the experimental plots on the reserve offered by the Ashburton High School, after conferring with the Board of Governors of the Ashburton High School thereon. We believe these are going on satisfactorily, and we hope that this is only the beginning of co-operation between the two Departments on similar lines.

The Board cordially support your decision to locate the professional staff of the Department of Agriculture connected with experimental plots and the farms at the Weraroa Central Development Farm, as we see much advantage both in the interests of research and education by such a step being taken.

In connection with the experiments on the Central Plateau in the North Island, where there is an immense area to be settled, the Board are pleased to note that, in reply to our request that these should be continued, you have given instructions for this to be done.

Rural Education.

The subject of rural education is one which has received a great deal of consideration from the Board. We had the advantage of a long and interesting conference with Professor Wood, Draper's Professor of Agriculture, Cambridge University, and Mr. E. S. Beaven, the well-known barley-breeder (who is working in conjunction with Professors Biffen and Wood, of the Cambridge University, as a plant-breeder), and we received much valuable information as to what was being done at that university.

These gentlemen came out here as members of the British Association which, it will be remembered, was sitting in Sydney when the war broke out. We had reports from Professor A. F. Woods, Dean and Director of the Agricultural Department, University of Minnesota (sent by Mr. Seth-Smith, of Christchurch); long reports of the investigations of Mr. Howell, Director of Christchurch Technical College, made in his tour round the world; reports from the gentlemen above mentioned in connection with the Cambridge University; from Professor Creelman, Director of Ontario Agricultural College, Canada, and from Professor Bailey, of Cornell University, State of New York, both of whom also visited New Zealand; a long and valuable report upon the whole subject of rural education from Mr. Hogben, late Director of Education; and much information from other gentlemen. A report was drawn out and adopted by the Board, and you were interviewed on the subject. You will remember that the interview was short, and nothing has been done since in connection with it, except that our President has drawn your attention not only to the report which the Board drew up, but to Mr. Hogben's contribution to the subject, and we trust you will go more fully into the matter at a more propitious time.

At the request of the Council of Agriculture the Board wrote to the Hon. Minister of Education urging that sections of land should be available where practicable near the various high schools for experimental purposes; also that a science master should be attached to such schools to supervise the agricultural education of the scholars, and to work in conjunction with the experts of the Department of Agriculture on similar lines to those that are being carried out at the Ashburton High School.

Afforestation.

This important subject has had the Board's close attention, and careful consideration has been given to the reports we have received on the matter from Mr. MacKenzie (late Under-Secretary for Lands), from Rev. J. H. Simmonds, and from Mr. E. Phillips Turner, F.R.G.S., of the Lands Department. We realize to the fullest extent the utmost necessity for continuing reafforestation, and we have urged time and again that the Government should extend this work. It has, however, always been pointed out that the war was the reason that planting to a greater extent had not been done. The Board's resolutions in connection with the subject, which have been passed on to the Government, are numerous, and there does not appear to be any need to repeat them here.

We would, however, like to draw your attention to the great probability that many returned soldiers might be prepared to undertake the work of reafforestation, especially after having seen how much importance is attached to this matter in other countries, and the result in Turkish countries where the work has been neglected. Trees cannot be planted if seedlings have not been raised, and we would urge that more money be expended in this direction preparing for the time, after the war, when a much greater area will no doubt be planted than hitherto.

We are glad to say that, in response to our request, the Hon. Minister of Lands agreed to our proposal that the Rev. J. H. Simmonds be asked to write a pamphlet on timber-trees suitable for planting in New Zealand for both timber and shelter purposes, also to give his opinion as to how the trees should be planted.

The Board also passed a resolution asking the Government to retain Tauhara Mountain, near Taupo, as a scenic reserve, this being almost the last native bush in that neighbourhood which, unless protected, will year after year be damaged by fires. We have had no promise on this point other than that the matter will be considered. We would, however, again urge that the preliminary steps of survey should, at any rate, be proceeded with prior to the Government taking over this as a scenic reserve.

A committee of the Board also waited upon Mr. Brodrick, Under-Secretary for Lands (who is in charge of the forestry operations of the Lands Department), and urged upon him that even under the present financial strain there should be no curtailment of the usual planting in the face of the rapidly approaching depletion of our timber-supplies. Mr. Brodrick stated that it was not proposed to curtail forestry operations, but that there was no money available for expansion. The Board is of the opinion that there should be no check in these operations.

We also had several interviews with Mr. D. E. Hutchins, F.R.G.S., who is at present in New Zealand in response to an invitation sent to him by the Hon. Minister of Lands, at the Board's instigation, for the purpose of reporting on forestry here. Amongst other matters dealt with, the best means to be adopted to conserve our timber, and the various qualities and varieties of trees that should be planted in New Zealand, were discussed with him, and the Board feel confident that when his report is completed it will be found to be of the utmost value in the interests of forestry. Mr. Hutchins's special qualifications and experience fit him to report on our forests, reafforestation, and future work, and we hope to see his report, when published, widely read.

It will not be out of place here to quote from the remarks of Mr. C. E. Lane-Poole, Conservator of the Forest Department of Western Australia, in the preface to the report on Australian forestry (by Mr. Hutchins) published by the Government of Western Australia, as showing the estimation in which Mr. Hutchins is held in connection with these matters: "Among the many distinguished members of the British Association who visited Australia in 1914 was the well-known forester, Mr. D. E. Hutchins. A graduate of l'Ecole Nationale des Eaux et Forêts, Nancy, France, he began his forestry career in the Woods and Forests Department of India. After some years of tropical experience he was transferred to Cape Colony, where he remained for twenty-three years, and was, it is universally acknowledged, the greatest factor in spreading a love of forests and an interest in arboriculture in that almost treeless country. Mr. Hutchins made a special study of extra-tropical forestry, and introduced into South Africa species from all parts of the extra-tropical world, and among them the sylva of Australia claimed his special attention. To-day all through those colonies, from Cape Point to the Limpopo River, may be seen extensive plantations of the Australian eucalyptus. With the development of the East African colonies Mr. Hutchins, who was then Conservator of Forests in Cape Colony, was chosen by the Colonial Office to organize a Forest Department in British East Africa. At various times during his career he has been called upon to visit and report on the forestry problems of different countries. His report on the forestry in Cyprus was furnished to the Colonial Office, and is a particularly interesting work."

The Board view with great pleasure the fact that Mr. Hutchins was employed to commence the demarcation of the forests in New Zealand when he was sent to demarcate the Waipoua Forest, and to indicate the sections to be retained for forestry purposes. It is hoped that this is only the beginning of this vitally important question to New Zealand, and that steps will very shortly be taken to demarcate the remaining forest areas which are suitable for timber purposes, and which would not interfere with settlement, as no time should be lost in completing this work, which has already been carried out in the neighbouring Australian States. The limits of our forests are so curtailed that in a few years' time, unless this is done and the Forestry Branch placed under the control of a trained forester, the whole of our native forests will have disappeared. Demarcation of our present forests is as important as the planting annually of a sufficient area for future wants, and should be gone on with. It is essential for conservation and demarcation purposes that the Forestry Branch should no longer be attached to the Lands Department, but should be separate, although it might remain under the control of the Minister of Lands. The Board has already recommended the Government to set aside areas suitable for future planting, especially in those districts which are easy of access, if there is a possibility of securing land which is not required for settlement purposes.

We would take this opportunity to say that we asked your predecessor to have Mr. Hutchins's report printed, as it is of the utmost importance to New Zealand that this should be done. He verbally promised to comply with our request, and to supply the Board with a number of copies of the report.

Phosphates and Artificial Manures.

The question of phosphates and artificial manures has received the very fullest consideration, and many interviews with Mr. Aston, the Government Chemist, Mr. Morgan, Director of the Geological Survey, and the Board in connection therewith took place. When Mr. Aston went to England we asked your predecessor to instruct him to make the fullest inquiry he could on the subject, and this Mr. Aston did at his own expense, and the information he collected was of great value. He made full inquiries in America about the cost of the Florida deposits, and when in London interviewed many of the companies which deal with raw phosphates. On his return he made a lengthy report on the whole question, a copy of which your predecessor was good enough to send to us. A promising source of raw phosphate seemed to be in Egypt, on the Red Sea, at a place called Safaga Bay; and Mr. Aston's inquiry seemed to indicate that this phosphate could be brought in returning troopships, and you were urged to get a certain quantity out for experimental purposes. A few hundred tons were accordingly brought out to New Zealand. The nearest source to New Zealand of raw phosphate, however, is in the Pacific Islands, from which an ample supply can be obtained under normal conditions at a reasonable price.

The Board fully recognize the great importance of this matter to the New Zealand farmers. Nearly the whole of the land in New Zealand, according to Mr. Aston's analysis, is wanting in this plant-food, and the Government would be well advised to take any steps it can to cheapen the supply of this necessary manure. It is certain that New Zealand must increase its products to meet its engagements after the war, and there is nothing more likely to bring this about than a cheap supply of phosphates for the farmer. So long as the Board is in existence no opportunity will be lost of securing or suggesting any possible means of supplying farmers with the cheaper phosphatic manure.

Steps were taken by the Board to ensure the continuance of the present supply of phosphates at a time when it was feared it might be stopped through the commandeering of vessels by the military authorities, and we are glad to say our recommendations were successful.

In July last the Board had a lengthy conference with Mr. Morgan, Director of the Geological Survey, with regard to making a careful search in various parts of New Zealand for deposits of agricultural lime and phosphate rock. Mr. Morgan pointed out that, owing to several members of his staff having enlisted, the Department was rather short-handed, but he informed the Board that a sum of money had been allocated for the purpose of locating limestone-deposits throughout the Dominion, and that a search for deposits of phosphate rock would be made at the same time. The Mines Department was making arrangements to examine the most likely localities, and hoped to be able to furnish a comprehensive and exhaustive report on the subject during the coming

year. Mr. Morgan mentioned that in Marlborough a thin band of phosphatic rock had been found in the Amuri limestone, containing from 45 to 53 per cent. of phosphate of lime. A thicker band had been discovered near Port Robinson, and good samples had been obtained in the Whangarei district, but the prospects of finding a payable deposit there were not good. Phosphates had also been found in Southland near the Waiau River in 1906. More careful examination of these places would be made at an early date. It was stated that the nearest locality to New Plymouth where limestone could be quarried on a large scale was a few miles up the Mokau River; the available analysis of this stone, which varied a good deal in quality, ranged from 72 to 92 per cent. of carbonate of lime. There was also good limestone on the Awakino River, north of the Mokau. Subsequently Mr. Morgan obtained and forwarded a number of valuable reports supplied by the Public Works Department's Engineers resident at Taumarunui, Stratford, and Wanganui regarding limestone-deposits in their districts. He later supplied reports on the investigations made regarding the availability of supplies from the deposits in the Mokau district. Specimens of stone which had been submitted for analysis turned out extremely well; in five cases out of six the analysis showed that the percentage of calcium carbonate ($CaCo_3$) was 93·4, 95, 95·4, 96·6, and 98, indicating that the limestone in the district was of very good quality, in one instance the deposit being exceedingly high-grade. Mr. Aston, Agricultural Chemist, also supplied us with valuable information regarding limestone-deposits in the Wairarapa and Manawatu districts.

The Board also had the great advantage of consulting Mr. Parry, Chief Electrical Engineer of the Public Works Department, on the question of the best means of crushing phosphate and limestone. He informed us that he has been making many inquiries in connection with the best mode of crushing the phosphate sufficiently fine for the purpose of top-dressing.

Carriage of Lime for Agricultural Purposes on the Railways.

The question of the Railway Regulations as they apply to the railway carriage of lime for agricultural purposes has received a good deal of attention from the Board. Mr. Hunt, one of our members, drew up a report in connection with the matter, and pointed out that the regulations as at present existing made no provision for lime coming or going oversea. There does not appear to be any reason why this should not be done, provided the Railway Department is satisfied that the farmer is charged a reasonable price, and that the transaction is a direct deal between the lime-works and the farmer. Our Board were approached in the case of lime coming oversea to the Taranaki District, as the Railway Department refused to grant the concession set out in the regulations. After giving the matter full consideration we are of opinion that the Taranaki people have a good case, inasmuch as the district is badly in need of lime, and there is no lime locally that could be obtained by rail direct from the works—that is, within the free-railage limit of 100 miles. The Board are going into the matter with a view of seeing whether some relief can be given to settlers in the district named, and we are making inquiries as to the price intended to be charged for the lime on trucks at the port in the Taranaki District to which it is proposed to ship it. When these particulars come to hand the question of further considering whether representations should be made to the proper quarter to get the regulations amended to meet the case will be fully gone into.

Potash-supplies.

We had a long conference with Mr. Pope, Mr. Aston, and Mr. Brown at a recent meeting in connection with some proposals that had been made to the Board regarding the supply of potash. After the matter had been fully discussed it was decided to recommend you to instruct the officers of the Department to make inquiries as to the practicability of utilizing the wood-ashes from sawmills for manurial purposes which are now going to waste, as some of them are of manurial value; also to ascertain whether anything could be done to obtain potash, iodine, &c., from the seaweeds on the New Zealand coast and potash from fern.

The experts expressed the opinion that there was very little prospect of the extraction of potash from these sources being a profitable undertaking in the face of the fact that the natural deposits would again become available at the close of the war.

In response to a request from the Board, Mr. Parry, Chief Electrical Engineer, submitted a report stating that strenuous efforts are being made the world over at the present time to discover new deposits of potash and economic processes for extracting potash from potash-bearing rocks, owing to the cutting-off of the supply of the natural deposits due to the war. Mr. Parry mentioned that a chemical process for treating feldspar was undergoing trial in the United States, also an electrolytic process for extracting potash out of alunite, and that recently a new electrolytic process for treating feldspar was patented in the United States. As the process was a simple one and capable of demonstration on a small scale, an experiment was carried out in the Dominion Laboratory, the result of which, although not altogether satisfactory or promising, yet was not quite conclusive, so it is hoped to repeat the experiment on a larger scale at Addington, and to conduct other investigations of a similar character at the first opportunity. Mr. Parry further stated that several electro-chemical and electro-metallurgical developments requiring the aid of electricity for their successful pursuit were in view, some of which will no doubt eventuate in course of time, such as the manufacture of nitric acid, caustic soda, hydrochloric acid, &c.; grinding phosphate rock and limestone and converting the rock phosphate into a soluble form, such as the preparation of bicalcic phosphate by the Palmaer process, which depends for its success upon the production of cheap hydrochloric acid by electrolytic means. There should, he states, be no difficulty in getting any of these processes into operation now that a supply of electricity is available, provided it can be proved that they are commercially and economically sound.

Amendment of the Fertilizers Act, 1908.

Among other matters affecting the agricultural interest of the Dominion and the various problems that have arisen in connection with the war might be mentioned the amendment of the Fertilizers Act, 1908. It was suggested to the Board that this Act might be amended to provide for a differentiation of the unit values in phosphates of varying solubility on similar lines to the scale that had been adopted by the Australian Government. A committee of the Board went carefully into the matter with Mr. Aston, Agricultural Chemist, and other officers of the Department. This committee recommended you to take steps to amend the law in the direction suggested, so as to bring it into line with similar Acts in Australia and Great Britain; also to provide that the fineness of grinding of the phosphate rock and other manures should be specified in the invoice. A further recommendation has recently been made to you regarding the appointment of a committee of the Board to act with the officers of the Department in regard to the drawing-up of amendments to the Fertilizers Act, and with the object of giving the vendor full credit for the amount of phosphoric acid contained in the fertilizer sold by him.

Sheep Statistics.

We had several conferences in connection with the collection of the sheep statistics with the Government Statistician, Mr. Fraser, and with Dr. Reakes, Director of the Live-stock Division. It was eventually decided that there should be two collections: the Government Statistician would collect from the shearing returns as at the 31st January, and the Department of Agriculture would continue to collect its returns on the 30th April, so that comparative data would still be available.

Export of Inferior Stud Sheep.

We also discussed with Mr. Pope and Dr. Reakes the question of the export of inferior stud sheep. Mr. Pope pointed out that the proposal to prohibit the export of inferior sheep would require the passing of legislation to deal with it, and such being the case we asked the New Zealand Sheep-breeders' Association of Christchurch, which first brought the question up, if it would suggest any means whereby this could be successfully done. The matter was further considered at a later meeting, when we had placed before us the views of Mr. J. D. Ritchie, late Secretary of Agriculture; but while members agreed that some check was necessary it was recognized that there were many difficulties in the way. Neither the Board nor the Department had the statutory power to prevent the export of inferior sheep, and in view of that fact it was thought better for the associations themselves to take action to remedy the trouble. It was, however, resolved, "That the Board of Agriculture perfectly approves of any effort made to keep up the quality of the stud rams exported, but as there is no legislation empowering the Department to prevent the shipping of inferior sheep it is hoped that the breeders' associations will deal with the matter themselves on similar lines to those adopted by the Romney Marsh Association."

It has been suggested to the Board more than once that they should endeavour to arrange for a conference of the various flock, herd, and draught-horse stud-book authorities, with a view of their coming to a decision to issue a complete publication yearly of each of the different breeds. This is a matter which the incoming Board might well take in hand.

The Board have already been in communication with the various breed associations throughout the Dominion, and have urged them to give effect to the recommendation of the Council of Agriculture to have all sheep for export carefully inspected and approved by their experts as being typical of the breed, and to make it publicly known in the outside markets where New Zealand stock is sold that no sheep should be recognized as stud sheep unless accompanied by a certificate from the breed association or flock-book authority with which the animals are registered.

Control of Contagious Mammitis.

The question of diseases of live-stock was fully discussed with Dr. Reakes, Director of the Live-stock Division, and in connection with the control of contagious mammitis the Board forwarded you the following resolution: "That contagious mammitis be made a notifiable disease under the Stock Act, and that before a proved affected animal be allowed to leave the owner's property she must be branded by an Inspector, so that she cannot be sold as a milker."

Eradication of Sheep-lice.

This question received the Board's consideration, and after a report had been drawn up by the committee appointed to go into the matter the following resolutions were passed:—

"(1.) That as systematic an inspection of sheep on farms as is possible be carried out by Inspectors, in order to see that the provisions of the Act regarding dipping are properly carried out. In this duty Inspectors to act as far as possible on the lines of advising farmers and making them realize the necessity and advantage of proper dipping, and only to adopt serious measures when they are not amenable to reason. It is recognized that before this can be done a larger staff of Inspectors is needed.

"(2.) For fulfilling the legal requirements of the Act in the matter of dipping only dips approved for the purpose to be used, these approved dips to be poisonous.

"(3.) Saleyard inspection of sheep to be continued.

"(4.) Advice to farmers, in the form of lectures, leaflets, and Press articles on proper methods of dipping, the right kind of water to use, &c., to be freely disseminated, and a general vigorous educational policy on the whole question to be adopted."

Light Railways.

Mr. Furkett, Inspecting Engineer of the Public Works Department, was good enough to confer with us in connection with the light-railway system for better facilitating transport in the backblocks. We were also furnished with a copy of the report that he made to the Government on the light railways in Belgium.

Mr. Parry, Chief Electrical Engineer, also gave us some instructive views in connection with the electrification of light railways, but it seems that nothing further can be done in these matters until after the war.

Shipping Refrigerated Space, and the Purchase of Meat-supplies by the Imperial Government.

The shipping question received much consideration, and the Board were represented at the conference which took place in connection with the purchase of New Zealand meat by the British Government, when the whole of our output was taken. There has been little friction in connection with this purchase, and one of the great points which led up to the sale was that if the British Government bought the meat they would take every care to supply ships to carry it. Had it been in private hands these same vessels might have been commandeered for the purpose of carrying troops. There is no doubt, however, that had it been possible to have the whole of our meat taken as usual to the London market the price to the producer would have been somewhat enhanced, but the Board is not aware of any complaint having been made on account of this, the producers evidently realizing that the British Government has been the gainer. At a further conference at which the members of the Board were present new proposals were offered by you on behalf of the Imperial Government at a higher rate than had previously been paid, and at this conference the producers present seemed to be thoroughly satisfied with the offer, and it was accepted by the meeting.

As some dissatisfaction had been manifested regarding the ownership of the meat in store at the end of the war, the Board made representations to the Right Hon. the Prime Minister and urged him to take steps to ensure that, at the conclusion of the existing agreement between the Imperial Government and New Zealand producers to purchase all the meat available for export, the whole of the stocks in store at the conclusion of the war should be taken over by the Imperial authorities and not thrown back on the hands of the owners. We are of opinion that this is a matter which should be pressed on the Imperial authorities, and we would again strongly urge that the Right Hon. the Prime Minister give effect to the representations which have already been made on the subject.

American Meat Trust.

In connection with the American Meat Trust we had several conferences of a very confidential nature with Dr. Reakes, Director of the Live-stock Division, and much information was supplied by him. The Board is not losing sight of this important matter.

Purchase of Wool-output for the British Government.

The members of the Board attended the conference which was called for the purpose of receiving an offer from yourself, on behalf of the British Government, to purchase the whole of the 1916–17 season's output of wool. The members present were glad to assist at the meeting, and it is gratifying to know that the arrangements you have made regarding the matter of valuing and paying for the wool are so satisfactory.

Wool damaged by Piripiri-seed.

Representatives of the Board interviewed the Right Hon. the Prime Minister in reference to the quantity of wool lying in Wellington, Christchurch, Auckland, Hawke's Bay, and other centres damaged by "biddy-biddy" (*piripiri*) seed, also as to the quantity of dirty wool which had been passed in at extremely low bids owing to the lack of carbonizing plants, as it was not wanted for the Home trade, and on account of the embargo on the export of wool to neutral and allied countries was absolutely unsaleable. The Board recommended that the Government be asked to allow this dirty and seedy wool to be shipped to Japan or other allied countries where suitable machinery for treating it is available.

Government Embargo on the Export of Hides.

In February, 1916, the attention of the Board was drawn to the fact that an embargo had been placed by the Government on the export of hides, and that as there were only a small number of buyers in the country there was grave risk that the sellers would be at their mercy. This matter was brought before the Hon. Minister of Munitions by our President, who expressed the opinion that if there was any risk of the supply of leather becoming insufficient owing to the export of hides it would be better for the Government to purchase the hides required for the manufacture of boots for the soldiers, and to allow the rest of the hides to be sold in the ordinary way on similar lines to those that had been adopted with regard to the purchase of cheese. The Hon. Minister stated that he was calling a conference, at which the tanners, bootmakers, and exporters were to be represented, and he would be glad if representatives of the producers could also attend; consequently two members of the Board were appointed to do so with Mr. Foster, of the Wellington Meat Export Company. A conference was accordingly held, and, as the representatives of the producers were in a minority, the decision that was come to was very unsatisfactory from the producers' point of view. Subsequently the Board decided to endorse the recommendation of the Council of Agriculture asking the Government to withdraw this embargo, which was a heavy

tax on the pastoral industry, while it was not calculated to benefit the producers. A deputation from the Board interviewed the Hon. Mr. Myers again in the matter; finally the embargo was withdrawn subject to the condition that the sellers should agree to supply the Government with 10 per cent. of the hides in hand if required to meet the military requirements. The hides question, however, seems quite satisfactorily settled now, and fair prices are being offered; there should be no further complaint in the matter.

The Wheat Question.

In January, 1915, we considered the question of the wheat-supply of the Dominion, which had been referred to us by the Right Hon. the Prime Minister, and we had an interview on the subject with Mr. R. Triggs, Assistant Public Service Commissioner, who detailed the steps that had been taken by the Government to import wheat from Australia and Canada. He also furnished us with particulars regarding the estimated yields of the wheat crops in the Dominion for the 1914–15 harvest, and the position as it would be at the end of 1915. We also went into these matters with Mr. M. Fraser, the Government Statistician, at the same meeting, whose figures revealed the fact that the importation of wheat would be necessary to carry on till the following harvest.

As a result of our deliberation of the subject the Board recommended the Government to remove all restrictions on the price of wheat, to publish the available information both as to local stocks of wheat and the price at which the Government could import it, and to arrange to import the wheat required to make good the local shortage and sell it at not less than cost price, thus ensuring that farmers would get the import price.

The Board met yourself and the Board of Trade early in January last to consider what would be the best means to adopt to induce farmers to grow more wheat. The Board of Trade proposed to requisition the whole of the wheat in New Zealand at the present time, and to guarantee farmers a certain fixed price for the duration of the war and for twelve months afterwards. There was, however, a difference of opinion amongst the members of the Board of Trade (and between them and the Board of Agriculture) as to what would be a fair price to guarantee. After a lengthy conference it was agreed that the Board of Agriculture should submit a report embodying its views to you, and a recommendation was sent to you the same day. Subjoined is a copy of the recommendation :—

"The Board of Agriculture has come to the conclusion that if the price for wheat is to be fixed, to increase the area grown, it will not effect the object aimed at if the price be below 6s. per bushel on trucks for good milling-wheat. If the price is fixed at less than this figure the Board feels certain that it will result in a further decrease in the area sown in wheat next season. In fact, the Board is by no means sure that even a guarantee of 6s. per bushel will result in a sufficient quantity of wheat being grown for the requirements of the Dominion. The Board is of the opinion, considering all the circumstances of the case, that it might be better to adopt an alternative plan and, instead of fixing the price for wheat, allow the trade to take its normal course and attempt to regulate the price by a sliding scale of duties. The present duty on wheat is 9d. per cental, and on flour and wheat-offals 1s. per cental. The Board does not think that any reduction of the duty on flour should be made, because it would tend to injure the flour-milling industry, which employs directly and indirectly a large amount of labour; but a reduction could be made in the duty on wheat and wheat-offals. The Board thinks that the duty on wheat and wheat-offals should remain as it is so long as wheat remains at 5s. 6d. per bushel for good milling lines f.o.b. Lyttelton or Timaru, which are the main wheat ports. This would be equivalent to 5s. 4d. per bushel on trucks at the average railway-station. For every increase of 1d. per bushel in the price of wheat beyond 5s. 6d. f.o.b. ports named a reduction might be made of 1d. per cental in the duty, and a proportionate reduction in the duty on wheat-offals. This would mean that by the time good milling-wheat reached 6s. 3d. per bushel f.o.b. the duty on both wheat and wheat-offals would come off altogether. The Board thinks that this would act as a sufficient check upon the undue increase in the price of wheat and flour. It thinks, too, that farmers would look upon it as a reasonable protection to the consumer, and it would not have the effect of frightening them from growing wheat. The Board does not recommend this as a permanent arrangement, but merely to operate during the currency of the war."

The Government, however, did not accept these recommendations, but shortly afterwards it was announced that it was fixing the maximum prices f.o.b. at the nearest port for the 1916–17 crops, ranging from an average of 5s. 8d. in February, March, or April, 1917, to an average of 5s. 10d. for wheat sold for delivery later than July, 1917.

The Government made no definite announcement at that time as to its intentions with regard to the 1917–18 crop, but it was generally understood that similar maximum prices would be fixed for the coming season. Our Board therefore called the attention of yourself and of the Hon. the Acting Prime Minister, Sir James Allen, to the fact that fixing a maximum price without guaranteeing a minimum one was calculated to deter farmers from growing the required quantity of wheat for the coming year, to which both you and Sir James Allen replied that Cabinet had decided to guarantee a minimum price of 5s. 5d. per bushel for next year's wheat-supply, or a price in excess of 5s. 5d. up to 5s. 10d. as a maximum, as the Government may determine; and it is to be hoped that in spite of the shortage of labour in the rural districts there will be a sufficient acreage sown.

Our President again urged that the minimum price should be raised to 5s. 10d. per bushel o.t., and after you had visited the Canterbury district, when you addressed many meetings of farmers and conferred with them in several places, you publicly stated that the Government would purchase next season's wheat at 5s. 10d. per bushel f.o.b. Our Board still think that the o.t. price would bring a much larger area into wheat than the f.o.b. price.

Labour for Harvest.

We had several conferences with Mr. Collins, of the Labour Department, in connection with the question of providing labour for harvest. He informed the Board that his Department had organized arrangements to assist farmers in harvest-time if labour was required. Although, owing to the bad season, there was apparently more available labour during the 1915–16 harvest than was actually required, the Board realize that country labour is being seriously reduced, and the greatest difficulty at present exists in getting ploughmen, the certain result of which will be a curtailment of the area under crop.

Assistance for Farmers in a Small Way drawn in the Ballot for Military Service.

At a recent meeting of the Board a letter was received from a member of one of the Military Service Boards stating that a number of farmers who are drawn in the ballot for military service, more especially in the back country, had frequently to dispose of their farms—in numerous cases they sell at a considerable loss—and pointing out that there is a danger in these circumstances of aggregation. The opinion was expressed that it would be much fairer to these men if the Government were to purchase their properties for settlement by returned soldiers. The feeling of the Appeal Board in question was that some steps should be taken to find out the minimum number of men required for the industry, as well as a census of the number available. In connection with this point our Board thought that some special inquiry should be made in the case of the small farmer working his own land without paid help, for in many such cases the income from the farm would be insufficient to pay the cost of hired labour. After discussion we decided to endorse the suggestions contained in the letter, and to forward representations in the matter to the Hon. the Minister of Defence.

Provision of Land for Returned Soldiers.

A number of recommendations referred to the Board by the Council of Agriculture, dealing with proposals as to obtaining suitable land for returned soldiers and placing them thereon with a view of their taking up farming, fruitgrowing, &c., were considered by the Board. After deliberation we submitted recommendations in the matter to the Right Hon. Minister of Lands, who subsequently intimated that suitable measures were being taken to give effect to them on the lines suggested.

Agricultural Banks.

On the subject of agricultural banks Mr. Edwin Hall, one of our members, drew up a long, valuable, and interesting report, of which a copy was sent to your predecessor, Mr. Massey, and a synopsis published in the *Journal of Agriculture*.

Export of White-pine Timber, and Import Duty on Timber for Boxmaking Purposes.

The rapid rise in the price of butter-boxes and fruit-cases seriously affected the dairying and fruitgrowing industries, and it has been suggested to the Board that the duty on timber imported for the purpose of making fruit-cases and butter-boxes should be removed. The New Zealand Fruitgrowers' Federation (Limited) drew the Board's attention to the fact that during the year ending 31st July, 1916, over 46,000,000 superficial feet of white-pine timber had been exported from the Dominion, and suggested that steps should be taken to have the export of this timber prohibited. After the Board had fully discussed the whole question it was decided to make no recommendation regarding the export of white-pine, but you were recommended to approach the Hon. Minister of Customs with the view of getting the duty on timber in shooks from British possessions imported for boxmaking purposes removed.

Introduction of Australian Stubble-quail into the Dominion.

By your direction a proposal that Australian stubble-quail be introduced into New Zealand was referred to the Board for their opinion. Inquiries made from Mr. W. J. Spafford, Superintendent of Experimental Works, Department of Agriculture, Adelaide, who had been recommended to the Board as one whose opinion regarding the life-habits of the bird would be valuable, corroborated the information supplied by the Acting Chief Inspector of Fisheries and Game in Victoria, which had been forwarded on to the Board by the Secretary of Agriculture. In both reports the opinion was expressed that Australian stubble-quail, if introduced into New Zealand, would not be likely to prove harmful to farmers; on the contrary, it was stated that these birds eat an enormous quantity of weed-seeds and insects, and mention was made of the fact that in southern Victoria their favourite food was the black seed of the spear-grass, dock-seeds, crickets, and weevils. It was urged by the Australian writers that it was one of the few introduced birds that was doing a very good work, and that it should be protected all the year round because of its value to the agriculturist as a weed and insect destroyer. In the circumstances the Board decided to advise you that in their opinion the introduction of the bird would not be harmful to the farming community. Copies of the reports were also forwarded to the New Zealand Farmers' Union for the information of the members of that body, who had expressed fears that the introduction of stubble-quail into the Dominion might prove a menace to the farmer.

Club-root Disease.

At a recent meeting of the Board the question of club-root disease was fully considered. It was mentioned that the disease had made its appearance during recent years, it was fast spreading, and even now it can be seen from the North Cape right down to Southland. Among the

Cruciferæ this disease has become such a serious menace that the Board considers some immediate steps should be taken to investigate it. If our principal industries—namely, sheep, mutton, lamb, wool, butter, and cheese—are not maintained at their present standard, which will be the case if our root-crops are injured by this disease to the extent that they are in many parts of the Old World, it will make an enormous difference in the production of the country, and the loss to the Dominion will be incalculable. As a result of our deliberations in the matter the Board have sent you a recommendation that an officer of the Biological Section of the Department of Agriculture be specially set apart to investigate this disease, and to see whether it is possible to find out not only the means of checking its spread, but also to ascertain the mode whereby it is spread, whether by seed or otherwise, and, if the former, what remedy can be suggested in the way of submitting the seed to a process to destroy the germ of infection.

Soil-survey of New Zealand.

The question of a soil-survey of the Dominion was brought before the Board by the Canterbury Philosophical Institute, before which body Mr. L. J. Wild, Lecturer in Chemistry at Lincoln College, had read a paper on the subject. The Board invited Mr. Wild to come to Wellington for the purpose of going into the matter, but unfortunately he was unable to get away when the Board's meeting was held. We had a report from Mr. Aston, Agricultural Chemist, setting out his views of a soil-survey, and later we discussed the question with both Mr. Pope and Mr. Aston. Mr. Aston mentioned that the collecting of soils for analysis in connection with a soil-survey was one requiring the utmost judgment, and which on account of its importance he invariably undertook himself. The opinion was expressed that the work of a soil-survey was one which should be undertaken by the Department of Agriculture, and that the Geological Survey Office could no doubt render great assistance in various ways. The Board accordingly decided to recommend you to have the work taken in hand by the Department of Agriculture and pushed on as quickly as possible. Our recommendation as to this is now in your hands.

The Fruit Industry.

This industry has also received our attention, and in the consideration of the subject the Board have had the advantage of the advice of Mr. Allport, one of our members, and a gentleman who is amongst the foremost fruitgrowers in the Dominion.

On the recommendation of the Board the horticultural stations at Tauranga, Waerenga, and Arataki were placed under the control of the Director of the Horticulture Division, Mr. Kirk, and at an interview we had with him we were glad to find that in taking the stations over he was determined to establish a proper system of record of the work to be undertaken at each station. In the past little attention has been paid to records at the State farms, and the advantage of much of the work already carried out in experimentation with fruit has thus been lost.

Considerable attention was also given to the matter of packing, &c., grading, inspection, handling, and shipping of fruit, and the best steps to take to bring about an improvement in the present system of handling fruit in transit was fully gone into, and representations in the matter were made to the shipping companies concerned.

The inspection of fruit for export was also fully considered, with a view to inspection being undertaken at the original place of shipment. Owing, however, to the scarcity of shipping-space on account of the war, together with the alteration of the route of the steamers which formerly called at a port in South America, there has been very little doing in the fruit-export business in the past two years.

The question of the establishment of experimental fruit-farms received much attention from the Board, and as a result of our consideration of the subject you were forwarded a recommendation that three additional farms of about 50 acres each be established in North Auckland, Central Otago, and Nelson districts.

Development of the Poultry Industry.

This question was considered, and amongst other matters connected with it we discussed with Mr. Gallichan, President of the New Zealand Poultry Association, and with Mr. Pope, Secretary of Agriculture, and Mr. Brown, Chief Poultry Instructor of the Department of Agriculture, the following points: Statistics relating to the number of poultry in the Dominion; the number of eggs at present produced, and the number that should be produced to satisfy local requirements and put an end to importations from abroad; the price charged for eggs by retailers, and the figure at which it pays poultrymen to produce eggs; the supply of table poultry; and the total value to the Dominion of the poultry industry.

The establishment of poultry-stations at each large centre was urged; also the granting of assistance to those engaged in the industry by means of instruction at the existing poultry-stations and at any others that might be established in future; and that egg-laying competitions, which are at present usually matters for private enterprise, should be conducted at the Government stations under the supervision of the Department's expert poultry officers. It was also urged that poultrymen be granted financial assistance where they were in need of it to help on their business, and that a commercial agent be appointed by the Government, who could organize the produce to the benefit of the producers and keep them clear of the exploiter. It was agreed that Mr. Gallichan should place the matter before the executive of the Poultry Association, and that they should at a later date interview the Board further in the matter, as we deem the poultry industry one well worthy of assistance.

Conclusion.

In concluding our report we wish to take this opportunity of saying that any section of the farming community has only to bring under the Board's notice any matter pertaining to agriculture and the allied industries and it will have the Board's immediate attention. We are desirous of doing all we can to assist in the development of the immense natural resources of the Dominion, in which agriculture fills a most important and, at the present time particularly, a national place. But for the war much more might have been done. We are aware that the energies of the Government have been devoted to assisting in bringing the struggle in Europe to a satisfactory conclusion, consequently the reorganization of the Department of Agriculture and many domestic matters have had to stand aside for a time. We hope, however, that this will not be made the excuse for delay in furthering the great object of the increase of our products. This can only be done by the advancement of knowledge, and we should not "wait and see" in anything of an educative character which will teach producers how to assist the Dominion by increasing its wealth.

Amongst other subjects of which no special mention has been made in this report, but which have been dealt with by the Board, are—

Scholarships for New Zealand youths to attend Melbourne Veterinary University.
Instruction by Department of Agriculture specialists to boys taking the agricultural course at the Technical High School, Christchurch.
Conference with Lincoln College Board of Governors on extending the scope of the College.
Scholarship-holders taking an agricultural course at Lincoln College.
Learners at the State experimental farms.
Junior judging competitions.
Opening up of fresh markets for New Zealand stud stock.
Restrictions on introduction of live-stock from Great Britain on account of foot-and-mouth disease.
Worm-nests in cattle in Australia, and steps to prevent its introduction into New Zealand.
New Zealand live-stock exhibit at Panama-Pacific Exhibition.
Regulations regarding quarantine, &c., of live-stock introduced into New Zealand.
Improvement of horse stock of New Zealand by subsidizing approved pedigree sires.
Registration of stallions.
Encouragement of horse-breeding for military purposes.
Restriction on removal of cattle affected with contagious abortion.
Compulsory analysis of stock foods and condiments.
Legislation for the registration of veterinary surgeons.
Identification in outside markets of meat exported from New Zealand.
Establishment of model dairy farm in Taranaki.
Purchase of additional land at Moumahaki Experimental Farm.
Reservation of Crown land at Grove Bush for agricultural-education purposes.
Land for closer settlement in Waiau Valley, Southland.
Crown lands and State plantations, Taupo and Rotorua.
Irrigation in Central Otago.
Afforestation of the Central Plateau of the North Island.
Local agricultural committees to work in conjunction with Department of Agriculture.
Summarizing and publication of agricultural experiments.
Agricultural methods in the United States of America.
Displays by Department of Agriculture at outdoor shows.
Dwellings for rural workers.
Government assistance to immigrants.
Government assistance to small farmers desirous of netting their properties.
Appointment of additional Poultry Instructors.
Bonus for discovery of phosphate-deposits.
Professor Bottomley's bacterized peat experiments.
Experiments to determine most effective substitute for basic slag.
Abolition of differential rating on Australian hardwood timber carried on the railways.
Control of apiary at Ruakura Farm.
Collection by school-children of grass and other seeds.
Government grading of grain.
Wheat and oat stocks in the Dominion.
Requisitioning of cheese for the Imperial Government.
Fencing Act in connection with rabbit-proof fences.
South American market for apples.

Yours faithfully,
James G. Wilson,
President of the Board.

APPENDIX.

NOXIOUS WEEDS QUESTION.

Report of Mr. E. Hall.

As requested by the Board, I have carefully examined some hundreds of letters that have been received in reply to their circular about noxious weeds, which were sent to 144 Road Boards, 56 Town Boards, 117 County Councils, 110 Borough Councils, 87 agricultural and pastoral associations, and to the 12 provincial secretaries of the New Zealand Farmers' Union (who sent about two thousand circulars to their members).

I have also gone through all the discussions that have taken place at the agricultural and pastoral conferences during the past twenty-five years, and it must be admitted the results are somewhat disappointing. It shows what a difficult subject it is, when so many practical experienced agricultural experts can suggest so little that can be done to improve matters.

One point, however, is quite clear. Practically all the public bodies are agreed that a Noxious Weeds Act must be retained on the statute-book. Only two—Kiwitea and Clutha—are in favour of its abolition, and only eight recommend that portions of the counties be exempted. Only three—Waipa, Whakatane, and Malvern—favour delegating the administration of the Act to the local authorities. Nine recommend non-enforcement in respect to Californian thistle; while seventy-seven are in favour of the total enforcement of the present Act. The remaining replies are either of an indefinite character or merely contain minor suggestions.

Mr. E. Clifton in his reply states the result is that it may be fairly accepted that the consensus of opinion is that in the best interests of the community a control is necessary, and that this control should continue to be confided to the State. The question, he says, resolves itself into one of the administration of control; that it should be so exercised and maintained that the maximum of efficiency with the minimum of irritation should result. He adds, it was decidedly the method of exercising this control that was chiefly discussed by the delegates who addressed the Council of Agriculture on this subject. The necessity of control was probably the principal reason. There was also the fact that the Parliament of the Dominion would most unwillingly reopen legislation on the subject of noxious weeds, and that most certainly the question could not be entertained at present. The chief considerations, he says, may be set out as—(1.) Is the method of control reasonably sufficient? (2.) Can it be increased without undue cost, hardship, and irritation on the community? (3.) Is the statute administered with discretion? (4.) Which weeds should be more specially controlled? (5.) Control on Crown and Native lands. As no one in New Zealand has had a wider experience of the administration of this Act than Mr. Clifton, we attach a copy of his reply, which deals fully with these points.

Setting aside for a time the many minor suggestions that have been made for the control of particular weeds, we may indicate the more wide-reaching recommendations that have been made to grapple with the problem in this and other countries.

A very exhaustive discussion on the subject took place at the Agricultural and Pastoral Conference held in 1913, when Mr. A. H. Cockayne read a paper on the weed problem and its significance to New Zealand agriculture, a summary of which is attached. He urged the need for a weed-survey, and stated that he would include as necessary in such a survey the following:—

(1.) The present distribution of each and every weed in all districts of New Zealand.
(2.) The loss caused by each weed on varying types of land devoted to different purposes and of different values.
(3.) The range of dispersal of each weed in New Zealand through both controllable and uncontrollable means.
(4.) The thorough study of all methods of mechanical control of each established weed, and their cost.
(5.) The thorough study of all indirect methods of weed-control, such as intensive farming, thorough cultivation, drainage, manuring and stocking systems; in fact, any work that is likely to increase the conditions favourable for the development of the required crops, and at the same time reduce the conditions favourable for weed-development.
(6.) The cumulative effect on all types of land of weeds that are not controlled.
(7.) The study of the cost and practicability of eliminating the migration of weeds.
(8.) Very careful data on the increase of production on weed-controlled areas correlated with the expense of undertaking such work.
(9.) The effect of prevention of flowering on perennial weeds.
(10.) The study of the phenomena of replacement on occupied land and the causes.

Mr. Clifton during that meeting also pointed out the necessity for classifying the various kinds of land, and suggested the appointment of a special Noxious Weeds Commission. He said:

In the first place, they had the high pastoral country, where there could be no great profit per acre. In such country, where it did not menace other lower country, it appeared simply absurd to enforce the Act. The same applied to a great portion of the Crown and Native lands. Most of these areas were the reject lands of the colony, and would not stand a great expenditure. The next would be the better type of pastoral land. In this case, as much of this country was on a lower level, the danger was that if it became weed-infested it menaced the agricultural lands. So far as Californian thistle was concerned on those lands, he did not recognize that it was of any serious importance. The third class would comprise the richer agricultural lands of the Dominion: there the Act should certainly be enforced. Mr. Pope, too, has long advocated that something should be done on these lines. Mr. J. D. Hall (Canterbury) moved, and Mr. Orbell seconded, that it was desirable to set up a Government Commission, comprised of landowners, departmental officers, and scientists, to inquire into the area and locality of lands affected with weeds, noxious or otherwise. The amount of damage that was done, and the methods by which the weeds might be dealt with, could also be inquired into. This was agreed to by the Conference.

I understand that the Hon. T. Mackenzie, when Premier, had approved of this proposal and decided to give effect to it, but as three other Royal Commissions had been appointed he thought it was better not to set up another at the time.

Mr. Pope, in September, 1912, while opposing such a Royal Commission on the ground of expense, recommended the appointment of a smaller one, composed of three or four officers of the Department, to divide the lands of the country into several classes; to state the extent to which the clearing of noxious weeds should be enforced on each class of country; to consider the vexed question of noxious weeds on Crown lands, and to determine those areas of Crown and unoccupied Native lands which the Government should deal with; and finally to submit definite proposals, which could afterwards be referred to the Parliamentary Agricultural Committee, and be brought into operation by an amendment to the Act. But up to the present none of these recommendations have been given effect to, and it seems there is little prospect of such a Commission being set up at the present juncture.

Although the replies to the Board's circulars were somewhat disappointing in some respects, they were of value inasmuch as no one previously could have assumed that the demand throughout the Dominion for legal control was so overwhelming and unanimous. This raises the question whether it might not be desirable to go a step further and send out another circular asking the farmers to give the names of the six worst weeds in their district and the most effectual means of combating them. Some most useful and definite information was collected in this way from a number of practical agriculturists in Great Britain.

The number of replies received from districts in which some of the worst weeds, such as Californian thistle, have not yet appeared suggests the question as to whether something more could be done to interest the boys in the rural schools—to teach them to identify the farmers' enemies, and so to call early attention to any new-comers before they grew too numerous to cope with. You are doubtless aware that Mr. T. W. Kirk prepared a number of leaflets which were published and distributed by the Department, and thus spreading much valuable information throughout the country about our most dangerous weeds.

The Canadian Government have gone a step further in this direction and distributed free to all the public libraries, colleges, public schools, agricultural societies and clubs a very fine work containing a large number of coloured plates of the farm weeds of Canada and their seeds, with simplified technical descriptions and details as to the best methods of checking their spread. The Dominion Executive of the New Zealand Farmers' Union urged that something like this should be undertaken in New Zealand. This course has also been adopted by the Victorian Government, and Dr. Ewart, the Victorian Government Botanist, in 1908 called attention to a plan for checking weeds by offering prizes to school-children, and mentions an instance in which prizes offered by a Magistrate resulted in the scholars bringing in twelve thousand plants of ragwort during the first four days, and this number quickly rose to nearly twenty thousand plants.

Closely connected with the question of the spread of weeds is that of the impurity of seed. The chief means of introducing and spreading weeds is by unclean seed. The most obvious method of checking weeds is to prevent them seeding.

The Australian Commonwealth are attempting to stop the introduction of injurious alien weeds by prohibiting the entry of the seeds of nearly a hundred of the worst weeds, such as are found as impurities in badly cleaned agricultural seeds. Farmers have long been urging that something on these lines should be attempted in New Zealand. Seven years ago Mr. Perry carried a motion at the Agricultural and Pastoral Conference asking the Minister of Agriculture to bring forward a Seeds Bill, so as to allow publication of full particulars of the testing of seed and to prevent the sale of inferior and unclean seed, and that we think is a recommendation the Board might reiterate. Mr. Kettle at that gathering urged that they should stop the sale of all but machine-cleaned seed.

The Iowa Seed Law, which has formed the basis for the seed laws of several States in America, provides that no person shall sell, offer, or expose for sale for the purpose of seeding any agricultural seeds unless they are free from the seeds of the following weeds: Charlock, quack-grass (*Agropyron repens*), Canada thistle, wild oats, clover and alfalfa dodder (*Cuscuta epithymum*), field-dodder (*Cuscuta arvensis*), and corn-cockle. And when the seeds contain more than 2 per cent. by weight of impurities or of a number of specified weeds—including docks, burr clover, sorrel, yellow trefoil, bracted plantain (*Plantago aristata*), bindweed, black mustard, smooth crab-grass, and a few others—the approximate percentage of each shall be plainly indicated in

the statement attached to every lot of seed containing 1 lb. or more that is exposed or offered for sale.

These provisions do not apply to seeds grown for food purposes only; or to any person selling seeds to merchants to be cleaned or graded before being offered for sale; or to seed branded "Not absolutely clean" held or sold for export outside the State only; or to seed sold and delivered by any farmer on his own premises for seeding by the purchaser himself, unless the purchaser obtains a certificate from the seller at the time of sale that the seed is supplied subject to the provisions of the Act.

We are told that sooner or later such a weed as Californian thistle will certainly spread throughout New Zealand. The enactment of such a law as this, which has been adopted in Canada and several of the United States, would undoubtedly retard such a spread to many districts where it is not now found.

This report is already too long or we might detail the various recommendations received with regard to the amendment of the Act, but a summary of those sent by the County Councils is attached. A small committee might be set up to formulate these, and to confer with the officers of the Department as to which, if any, it might be desirable to endorse and adopt. We may mention in passing that the Iowa Seed Law provides that the weeds on the highways should be cut by the officers of the Road Board and paid for out of the rates. It has often been urged that this is a better plan than waiting for each settler to clear his own frontage.

At the 1893 conference a resolution was passed urging the Government to grant a bonus for the invention of a cheap method of destroying weeds. Mr. J. H. Williams stated that he had successfully dealt with small patches by a solution of arsenic (1 oz. to the gallon); but Mr. T. W. Kirk stated the Department had conducted numerous experiments with arsenic, and he had found no method cheaper than cutting; and, generally speaking, this has been the experience of most New Zealand farmers, though a certain amount of success has resulted from the use of salt, carbolic acid, sodium arsenite, and the sulphates of iron and copper under specially favourable conditions. For example, spraying with sulphate of copper destroys charlock and mustard, and the Vermont Agricultural Experimental Station reported favourably on attacking hawkweed and other weeds with salt. We think, too, that the hands of the Inspectors of Noxious Weeds would be strengthened if the Department could arrange to supply them with copies of some of the letters received from public bodies in their districts urging that the Act be fully enforced, and containing suggestions as to the best course to be adopted with regard to certain dangerous weeds.

To briefly summarize the above, the following seem to be the most feasible recommendations that have been suggested:—

(*a*.) The initiation of a weed-survey.
(*b*.) The appointment of a Commission or committee to inquire fully into the question, and to classify the different areas growing noxious weeds, and to state the extent to which the clearing of weeds should be enforced in each.
(*c*.) To send out another circular to practical agriculturists asking the names of the worst weeds in their centres, and the best methods of dealing with them.
(*d*.) To enlist the assistance of the education authorities, and to distribute throughout the schools, &c., descriptions and plates of the worst weeds to enable young people to recognize them before they become a menace to the district.
(*e*.) To take steps to prevent the dissemination of unclean seed.
(*f*.) To set up a committee to consider the proposed amendments to the Act.
(*g*.) To supply the information already collected to the Weed Inspectors.

The Taranaki New Zealand Farmers' Union Conference urge the planting of all badly broken weed-infested land with pines, preferably *Pinus insignis*, as the most effective means of suppressing weeds of all kinds.

The United States Department of Agriculture reported in 1913 that very few of the common weeds troublesome on the farm can survive the dense shade of a good crop of hemp. If the hemp makes a short weak growth, owing to unsuitable soil, drought, or other causes, it will have little effect in checking the growth of weeds, but a good dense crop, 6 ft. or more in height, will leave the ground practically free from weeds at harvest-time. In Wisconsin, Canadian thistle has been completely killed and quack-grass severely checked by one crop of hemp. In one 4-acre field in Vernon County, Wis., where Canadian thistles were very thick, fully 95 per cent. of the thistles were killed where the hemp attained a height of 5 ft. or more, but on a dry gravelly hillside in this same field, where it grew only 2 ft. to 3 ft. high, the thistles were checked no more than they would have been in a grain crop. Some vines, like the wild morning-glory and bindweed, climb up the hemp-stalks and secure light enough for growth, but low-growing weeds cannot live in a hemp-field.

The Ontario Experimental Union have recently initiated a series of co-operative experiments to ascertain the best way of dealing with any particular weed. The weeds selected for the experiments in 1912 and 1913 were perennial sow-thistle, twitch-grass, bladder-campion, and wild mustard. Six experiments in all were outlined, namely: (1) The use of rape in the destruction of perennial sow-thistle; (2) a system of intensive cropping for the eradication of perennial sow-thistle; (3) the use of rape in the destruction of twitch-grass; (4) a method of cultivation and cropping for the extermination of twitch-grass; (5) a method of cultivation and cropping for the eradication of bladder-campion; (6) spraying with iron sulphate to destroy mustard in cereal crops.

5th December, 1916. EDWIN HALL.

REPORT OF MR. E. CLIFTON.

At the conference of agricultural and pastoral societies, at the meetings of farmers' unions, and very specially at the session of this year of the Council of Agriculture, the control of noxious weeds has been very comprehensively discussed. This subject has also been referred to agricultural associations throughout the Dominion. The officers of the Department of Agriculture have year after year furnished very complete reports on their operations and on the results obtained. As Director of that division of the Department of Agriculture to which the administration of the Noxious Weeds Act was confided I have endeavoured to place the position as fully as possible before those conferences and before the agricultural community. We may therefore feel with all assurance that the subject is well known throughout New Zealand.

The result is that it may be fairly accepted that the consensus of opinion is that in the best interests of the community a control is necessary, and that this control should continue to be confided to the State. The question resolves itself into one of administration of control—that it should be so exercised and maintained that the maximum of efficiency with the minimum of irritation should result. It was decidedly the method of exercising this control that was chiefly discussed by the delegates who addressed the Council on this subject. The necessity of control was probably the principal reason. There was also the fact that the Parliament of the Dominion would most unwillingly reopen legislation on the subject of noxious weeds, and most certainly the question could not be entertained at present.

The chief considerations may be set out as—(1.) Is the method of control reasonably efficient? (2.) Can it be increased without undue cost, hardship, and irritation on the community? (3.) Is the statute administered with discretion? (4.) Which weeds should be more specially controlled? (5.) Control on Crown and Native lands.

1. The statute is administered by local Inspectors, who are under the immediate observation of Field Supervisors. These are really group officers. The whole force of local Inspectors and group officers are under the supervision of the Director and Assistant Director of the Fields Division of the Department of Agriculture; and, further, through the Secretary of that Department and through the Hon. Minister of Agriculture the general policy of the administration of the control is defined. All who are concerned in the administration of the Noxious Weeds Act, from the Hon. Minister to the local Inspector, recognize that a wide discretion is demanded and essential; that there are districts where certain scheduled weeds—as blackberry, Canadian or corn thistle, and ragweed—are of so great or general distribution that control is not possible: those consist chiefly of lands in open forest, or ordinary forest lands in the process of clearing, or those felled and cleared and grassed but on which a quantity of unburned logs remain. Another class is that of purely pastoral lands of so limited a capacity for stock-carrying that the expenditure that control would entail would be beyond the possible realization of revenue from such properties. Control is not reasonable under such conditions, nor is it attempted; yet those lands involve some of the gravest difficulties that attend the administration of the Noxious Weeds Act. Weeds from these districts where control is not attempted are distributed to other areas that may be comparatively free from infestation. This is a condition that no statute, however it may be administered, can modify. The Inspectors endeavour to induce those landowners that are in this unfortunate position to attempt some control. This is done with all discretion. Very often a useful control is effected and at no great expenditure of labour or money, for the conditions are different: the forest lands, specially those in process of clearing, are open to the reception of weed-seeds, whereas established pastures are by no means susceptible, and on farms cultivation disposes of the greater proportion of such weeds. This refers more directly to blackberry and ragweed than to the Canadian thistle: these lands present great difficulties. It would appear that there is but a palliation; the greatest discretion in dealing with such lands is demanded of the Department of Agriculture. Fortunately there remain many districts practically clear of serious weeds that are not menaced by contiguous infested areas; it is here that the landowners desire direct and efficient control, and the statute and Inspectors are supported.

2. Can efficiency be increased? It is difficult to realize in what direction this may be secured; it certainly cannot be obtained without recourse to legal procedure, and to this irritation would be strongly manifested. The only possible warrant for such action on the part of the Department would be the mandate of the farmers of a district, and that is not probable.

3. Is the statute administered with discretion? The addresses of the various speakers at the Council and at other meetings made no reference to harshness of administration; the delegates of at least two districts supported the work of the officers of the Department.

4. Which weeds should be more specially controlled? On forest and pastoral lands where the infestation is but commencing and some control possible, blackberry and ragweed; on established pasturage and farms, the same weeds, with some attention to Canadian thistle.

5. Control on Crown and Native lands: The effective control of weeds on these lands would require a greater expenditure than the whole of the revenue of the Dominion would supply. A certain control is in operation; it is that there is an allocation of money in the hands of the Commissioners of Crown Lands, which is expended by them on the representation of the local Inspector of Noxious Weeds. These recommendations refer generally to such areas as affect adjoining occupied lands. Let it be remembered that to a great extent remaining Crown lands are those that from quality of soil or from natural features are not attractive for settlement, and for this reason do not warrant great expenditure. There are also many reserves for different purposes that come under the same method of control. These reserves are the cause of considerable annoyance. They often come into close proximity to settlement; there is a menace

to the adjoining farmers. Every endeavour is made to control weeds on these reserves, but the allocation of available moneys does not always permit of as complete a control as could be desired.

The Hon. Minister of Native Affairs has an allocation of money for the control of weeds on Native lands. This is expended in the same manner as already described in relation to Crown lands. There is the added complication of the Native titles. It is in practice seldom possible to induce the Native owner to control weeds, or to claim successfully the cost of clearing, if it has been found necessary that the Inspector has so cleared them. The liability for weed-control, or the means of recovery for the cost of clearing, is in practice only possible when the land has not only been individualized but also allocated to the individual.

There is greater irritation over weed-infested reserves and Crown and Native lands that adjoin occupied areas than from any other cause. There comes into this the fact that the control cannot be truly effective unless a much larger appropriation of funds is available than has been provided in the past. With such an increased amount of money reserves could, of course, be more effectively dealt with. Crown lands cannot well be more thoroughly cleared of weeds: formation, quality of soil, and extent preclude. It should be, however, a recommendation that those more immediately affecting settlement should receive the greatest possible attention. Native lands are being but slowly brought under control.

There is the possible consideration that local authorities may be associated with the departmental officers in an advisory capacity. In this there is the limitation that all local authorities are naturally unwilling to place themselves in a position of antagonism between themselves and the immediate community.

The other consideration, if it be decided to reopen the whole question, it is submitted, is that the first measure should be the appointment of a Commission that would investigate the whole subject. Such a Commission should include agriculturists, scientific and professional men, as well as certain officials. The field would be—weeds to be controlled; means, other than manual; districts that should be under control (the clear definition of the position); is the present administration recommended to the support of the community; should it be altered, and in what manner? The one chief result would be that the community would so secure advice that could be relied upon. If it came about that the administration of the present be endorsed there would be obtained the confidence of the public in the Department that may be accepted as the chief reason for the present unrest. If present conditions are deemed unsatisfactory, the earlier this becomes known the better for the Department and for the community.

There is also the recommendation that the services of scientists should be constantly availed of.

It may finally be submitted for your consideration that the present control is at least reasonably effective, that it has been conspicuously impartial and fair, that it has avoided unnecessary irritation, that it is operated with discretion, and that in this there is a warrant for the confidence of the community to continue its support to officers of the Department.

28th September, 1916. E. CLIFTON.

REPORT OF MR. A. H. COCKAYNE.

Weed-survey Circulars.

About eight hundred replies to the forms sent out by the Board of Agriculture have been received, and much valuable information has been secured. The following notes, based on the reports, are submitted only as a *résumé*, and it is proposed to prepare a much more detailed report in a form suitable for publication in the Departmental *Journal* if such a course meets with the approval of your Board.

Need for Detailed Weed-survey.

The very contradictory reports that have been received from farmers in the same locality show that in many cases the type of land and the utilization to which it is put has a great bearing on the farmer's individual opinion as to what constitute the worst weeds and what methods should be adopted. From this I consider that a proper weed-survey should be undertaken by the Department. The Field Inspectors are quite capable of carrying out this work, and special attention should be given to the type of ground on which weeds are a serious source of loss, and the general types of management that should be adopted and which are practicable. During the course of this survey each officer could map out with a fair degree of accuracy the different types of ground and different methods of soil-utilization that call for different methods of control, even for the same weed in the same district. In this way a good deal of the difficulty at present existing in dividing the country into belts where different types of weed-control should really be carried out could be got over. Each Inspector could carefully consider and get together all the different methods adopted and suggest improvements in the type of farm-management that would increase the efficacy of any method. Finally, when the work was completed, a weed-map of each district could be worked out and reasonable methods of control formulated for different areas.

The Effect of the Noxious Weeds Act.

Peculiar as it may seem, the replies as a whole show that the Noxious Weeds Act has had a most peculiar effect on the common-sense and individuality of the farmer himself. The Noxious Weeds Act lays it down that the cutting so as to prevent flowering is the basis of all weed-control. Thus in a very large number of cases the only method of control for weeds gazetted as noxious that was given was to cut down so as to avoid flowering, the farmer realizing that the acceptance of this procedure satisfied the present inspectorial system. In marked contrast were the replies as to control of weeds such as couch-grasses, yarr, bracken, water-fern, piripiri, manuka, and other weeds not included in the Noxious Weeds Act. In such cases the replies indicated an intelligent appreciation of practical methods of reducing the loss of production due to these weeds. The value of sound management directed towards actually controlling such weeds was emphasized, and in no case was satisfying the provisions, often quite impracticable, of an Act of Parliament the objective desired. I think on the whole this was the most remarkable feature of the replies in general. Another point that was very noticeable was that certain gazetted noxious weeds, especially Californian thistle, were mentioned as the most serious weeds of the district, irrespective of whether they were causing any appreciable harm or not. In many cases, after enumerating Californian as the worst weed of the district, a footnote was appended to the effect that little if any of the weed existed in the district. This widespread fear of Californian was most noticeable in districts where it is not as yet particularly widespread; in those where it is abundant it is evidently held in less dread.

Contradictory Opinions.

As was to be expected, very contradictory opinions on the value of cutting down annually such weeds as Californian thistle and blackberry were expressed in the circulars, even from the same district. In certain cases cutting alone was advocated and said to be effective, but the reverse was stated in the majority of cases. Really scientific evidence on the value of cutting is much wanted.

Variation of Control on Individual Holdings.

A very important point that regularly cropped up in many of the replies was the necessity for the same owner to adopt different methods of repression on different parts of his property. This indicates that the question of dividing land up in different belts, as has been often suggested, is a very difficult matter, and really each farm needs to be separately dealt with. The need for this was well exemplified in many of the answers, which showed that the average farmer was very desirous of controlling weeds in every case where measures could be profitably adopted, but showed a strong reluctance to deal with land where control was simply directed towards a reduction in flowering without any other direct benefit being secured.

The Prevention of Infection from Infested to Clean Land.

It was very remarkable that in the majority of cases very little stress was laid on the necessity of control on what is virtually waste land or completely infested land. The theory that control should be directed to avoid further infection had on the whole few advocates, except in certain districts, notably in the wheat-belt of the South Island. The actual repression of weeds and future profitable employment of badly infested areas, provided the work was practicable, was emphasized in many replies—that is, the improvement in *utility* of weed-infested areas was the dominant note struck. This, of course, is to be expected from farmers who deal more with the individual than the national aspect of weed-control. But if individual effort directed against weed-repression—that is, more or less complete eradication—becomes general, then it follows that the national aspect is more fully satisfied than under the present system. It, however, was notable that farmers not particularly troubled with weeds were desirous in most cases of making their less fortunate brethren carry out the Act in its entirety.

The question of the non-cutting of weeds on Crown and Native land was frequently dealt with, and the consensus of opinion was that the work of cutting should be rigorously carried out, but in only a few instances did the private owners suggest that they should carry out the same method on their own properties. It, however, was noticed that in but few instances was there any suggestion that the Act should be repealed, but that it should be virtually inoperative over certain types of privately owned country was repeatedly pointed out. The desire for information on rational methods of suppression, especially with weeds not in the Noxious Weeds Act, was very general, and indicates once more the urgent need of a proper weed-survey dealing with all phases of the subject.

The General Tone of the Replies.

It was with very great pleasure that I noticed the great care and attention that had been given to the filling-in of the forms as a whole. Only in a few instances were the circulars treated more or less as a joke. The farmers' propensity for humour could not in certain instances be repressed, and the replies "Go to the war, young man," and "The local Inspector is the worst noxious weed of the district," naturally made their appearance on two of the forms. Serious attention towards the circular was, however, a notable feature, and indicates clearly the important position weeds and their control occupy in the minds of farmers.

Main Weeds reported in Order of Importance.

(669 circulars were selected from the 800-odd. The remainder were of no particular value.)

South Island.		North Island.	
328 Replies.	Times reported.	341 Replies.	Times reported.
1. Californian thistle	262	1. Blackberry	304
2. Couch-grass	150	2. Californian thistle	249
3. Fat-hen	133	3. Gorse	179
4. Yarr	130	4. Ragwort	162
5. Sorrel	99	5. Ox-eye daisy	141
6. Sweetbrier	94	6. Pennyroyal	123
7. Gorse	93	7. Foxglove	70
8. Docks	82	8. Piripiri	56
9. Ragwort	80	9. Winged thistle	42
10. Blackberry (27 Nelson) ..	60	10. Sorrel	39
11. Broom	51	11. Variegated thistle	37
12. Yarrow	48	12. Buttercup	32
13. Wild turnip	45	13. Bathurst burr	23
14. Ox-eye daisy	36	14. Fat-hen	21
15. Shepherd's purse	30	15. Inkweed	20

It will be noted that ten of the main fifteen weeds of the South Island are arable-land weeds and five pasture-weeds, while in the North thirteen of the fifteen main weeds are pasture-weeds. This is, of course, to be expected when the difference in farm practice between the two Islands is considered.

The Main Weed Districts and Main Characteristic Weeds.

Districts.	Weeds.
1. Southland, South Otago	Californian, yarr, ragwort.
2. Central and North Otago	Californian, fat-hen, sorrel.
3. Canterbury	Couch, Californian, fat-hen.
4. Kaikoura, Blenheim	Californian, sweetbrier, gorse.
5. East Nelson, South Wellington	Blackberry, foxglove, Californian.
6. Wairarapa	Gorse, Californian, winged thistle.
7. Manawatu, Rangitikei	Californian, pennyroyal, blackberry.
8. Forty-mile Bush	Californian, blackberry, ragwort.
9. Taranaki	Blackberry, Californian, ragwort.
10. Hawke's Bay	Blackberry, Californian, variegated thistle.
11. King-country	Blackberry, Californian, inkweed.
12. Waikato	Blackberry, Californian, gorse.
13. Tauranga	Blackberry, Californian, ragwort.
14. Auckland	Blackberry, gorse, pennyroyal.

A very noticeable feature was that the same weeds were over very large areas, provided the soil and climatic conditions were similar, and indicates the futility of local bodies having the power to add weeds. A weed when gazetted should be a noxious weed over the whole of the district where the conditions are suitable for its spread. The replies show that many if the weeds have a well-marked local distribution.

Methods of Control.

The circulars require very careful tabulation with regard to suggested methods of control, and also need careful consideration. Many of the answers to any one knowing the country are manifestly impracticable, but in other cases much useful information is given. I have appended here my notes on Californian thistle as gathered from a careful study of the circulars, and also from my own personal knowledge.

In Southland and South Otago Californian is ranked as the most serious weed, but there appears to be a general consensus of opinion that on grass land it is not particularly serious. The value of cutting is difficult to ascertain, some declaring such procedure valueless, while others assert that patches weaken under the process. It is noteworthy that many report laying down in permanent pasture as the most satisfactory method of dealing with thistly land. On arable land the general practice is to plough in autumn and work the land till into the new year, sowing down with turnips or swedes in ridges, and continue with a horse-hoe until the early autumn; follow this with spring ploughing, early summer cultivation, and a second crop of turnips, followed perhaps in the next year with rape and grass, a liberal seeding of clover being included in the mixture. Quite the most significant feature of thistle-control in Southland is the attempt to introduce conditions unfavourable to the development of the weed during its growth period, and at the same time fully utilize the land during the long period the thistle

is dormant. The introduction of a rapidly maturing smothering catch-crop to replace summer fallow is worthy of consideration. A modification of the above method is to plough in December and work for a whole year before sowing turnips. The main point generally emphasized is to sow as late as possible in the season. The important period of cultivation is from the middle of December to the middle of January. No mention is made of the value of lucerne in controlling thistle, and it is dubious whether this practice, applicable to drier districts, would be of much value.

In Central and North Otago Californian is ranked as the most serious weed, mainly on account of its bad reputation. It is remarkable that lucerne-growing is not generally adopted to control thistle on badly affected land in this district.

In Canterbury Californian ranks second amongst noxious weeds, pride of place being taken by one or other of the couch-grasses. Californian control in Canterbury is essentially different to that in Southland. The thistle apparently exists mainly in comparatively small patches, and affected ground is virtually quarantined, and a long continuous cultivated fallow, extending sometimes over years, is adopted. Salting up to the rate of 24 tons per acre is also regularly recommended and apparently carried out. The vigorous cutting of thistle on all waste ground is urgently demanded.

In Kaikoura-Blenheim district lucerne-growing is universally recommended on ploughable land, and this is apparently successful both on mown and grazed lucerne areas. In Nelson Californian falls to fifth place as a noxious weed.

Coming to the North Island, a great diversity of opinion is held as to the harmfulness of Californian. Many report that cutting is of no value, and proper stock-management, subdivision, and attention to pastures by top-dressing, &c., is the best course to take. Others again report that cutting is the only possible successful method. The variation in opinion is so great that the matter required the most careful examination. The replies indicate that control measures must vary in accordance with the type and character of the ground. I have divided this into four grades.

Some Tentative Suggestions regarding Control.

(1.) *On Cropping-land.*—On such land where Californian thistle exists in small patches it may be advisable to adopt the Canterbury system of semi-quarantining the land and adopting very expensive methods of control by continuous cultivated fallow, heavy salting, &c., the expense of such work being debited to the working of the whole farm and looked upon as an insurance policy against further infection. This system, however, is impossible where the patches are at all numerous and large, and under such conditions a system such as that adopted in Southland should be carried out—short fallows, the use of winter-growing forage crops, smothering summer forage crops together with grain crops at intervals, and the liberal employment of temporary pastures, consisting largely of clover cut for hay, perhaps twice in the season. Lucerne-growing on thistle land should never be overlooked, but is advocated only in localities where lucerne is known to thrive. In Central and North Otago, for instance, the use of lucerne should be largely encouraged on thistly land, but in many parts of South Otago and Southland such a procedure would, at least with our present knowledge, be economically unsound. Soiling-crops, especially those that can be cut several times during the summer, are to be highly recommended. In many localities the repression of thistle should be followed by the laying-down of fairly long grass leas, and investigations on this point are required. The restriction of fallowing and its replacement by catch-cropping also is in crying need of study.

(2.) *On Grass Land capable of being ploughed.*—By such land is meant that suitable for arable farming, but which the farmer would prefer to remain in permanent grass. Such land is often of good quality, and soil-amendments, especially by drainage and top-dressing, by encouraging a thickening of the sole during the dormant period of the thistle, would often do far more good than cutting. Mowing, however, should be done wherever such a procedure is payable, and careful attention to stocking, especially heavy stocking, during the flowering and seeding stages is required. The good effect of rubbing-posts in thistle-patches is an indication of the value of trampling, and there appears little doubt that the trampling method of control could be considerably developed, especially by growing special crops and feeding them out on thistle-patches. Where methods such as the above are not successful then cultivation methods as suggested for cropping-land would have to be undertaken, and finally, when the weed was sufficiently weakened, the land laid down again into permanent grass.

(3.) *On Grass Land temporarily incapable of being ploughed.*—Such land may either be level (potential cropping-land) or undulating (potential turnip and forage-crop country and capable of being reseeded to pasture), but the limiting factor rendering it incapable of immediate cultivation where such a procedure would be advisable is the presence of logs and stumps. Efforts directed towards logging up the land, and a certain amount of stumping of the better-class land, must precede any definite efforts towards Californian-thistle repression. Small areas should, however, be cleaned up annually, subdivision carried out so that areas can be thoroughly stocked, especially with cattle, during the flowering and seeding stages, and plenty of attention given to top-dressing. As soon as the land is in a sufficiently clean condition for ploughing, the level lands should be cropped with smothering forage crops and those crops that mature and are fed off during the dormant season of the thistle.

Lucerne-growing should always be in mind in dealing with level thistly land as soon as it is fit for ploughing, taking off first either a turnip or rape crop, in the latter case sowing late and feeding off finally in the early spring, and laying down lucerne in the summer. On the hillier land, after logging, &c., where the pasture is poor and needs renewing, careful attention towards sowing down again into permanent pasture should be given. In many cases it is probable

some system of annual forage-plant cropping, combined with temporary pastures largely composed of Italian rye and cow-grass, may have to precede any final resowing of a permanent nature. On level land, temporary pasture, fed on during autumn and winter, shut up for a double crop of hay—first cut rye-grass and second cut red-clover hay—should prove very useful. Such temporary pastures may in many localities last two years, and in the autumn of the second season be heavily seeded with a cocksfoot mixture, a light disking and harrowing being perhaps a sufficient preparation for a seed-bed in certain localities. Many modifications naturally suggest themselves, but all the operations preceding the final sowing must pay for themselves, and at the same time be directed towards the weakening of the thistle by either fallowing, mowing, or very heavily stocking the thistle areas during the main period of growth (November to February). The general clearing of land of this description in order to facilitate ploughing is, however, the first consideration.

(4.) *On Grass Land permanently incapable of being ploughed.*—On such land no direct mechanical methods of control should be attempted. When a farm consists solely of such country very little can be done except by subdivision and heavy stocking at definite periods. The capabilities of top-dressing should never be lost sight of, especially to secure good autumn, winter, and spring growth of grass during the dormant period of the thistle. This will thicken up the sole, probably the most important of all means of indirect control of weeds. The burning and surface sowing of thick patches of thistles in the autumn with vigorous-growing grasses and clovers should be studied in this connection.

(5.) *On Grass Land of extremely poor Carrying-capacity.*—On such land no control of any sort is advisable, as thistles on such land, provided they will continue to grow, do more good than harm, and may finally lead to the production of quite fair grass land.

All the other weeds reported in the circulars are being dealt with seriatim, and when completed some quite useful information will be gathered together. It will, at any rate, serve as a most valuable foundation on which to base a proper weed-survey, a work that is at present even more essential than any immediate alteration of the Noxious Weeds Act. One fact, however, is patent, and that is, weed-control in New Zealand must have as its immediate object the lessening of damage to the land actually occupied by weeds, or, as it may be expressed, the proper breaking-in of weed-infested country where feasible. The great sheet-anchor of the *in toto* supporters of the present Noxious Weeds Act—that its objective is the protection of clean country by the cutting-over of infested land—must be partly abandoned. With proper attention the clean land can be kept clean, but this cannot be done merely by attempting to stop the spread of weeds from affected country by cutting them. Over vast areas of New Zealand the cost would be prohibitive. The aim of all future weed-control is individual effort directed towards reducing the effects of weeds on individual holdings. No single method of control is possible, but with the employment of sound methods of farm practice directed towards weed-repression the individual will greatly reduce his loss by weeds, and if well-thought-out methods of repression varying in accordance with soil, climate, and the method of soil-utilization are generally adopted the weed problem will gradually disappear. All this demands a clear knowledge of the weeds of New Zealand, and the first essential is a properly conducted weed-survey, which in my opinion would be of far greater immediate value than a soil-survey, and might indeed pave the way for the carrying-out of such work on a truly practical basis.

A. H. COCKAYNE.

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