SESSION II.
1921.
NEW ZEALAND.

DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT FOR 1920–21.

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

SIR,— Department of Agriculture, Wellington, 5th October, 1921.

I have the honour to forward herewith, for Your Excellency's information, the report of the Department of Agriculture of the Dominion for the financial year ended the 31st March last.

I have, &c.,
W. NOSWORTHY,
Minister of Agriculture.

His Excellency the Governor-General.

REPORT OF THE MINISTER OF AGRICULTURE.

THE past agricultural year was marked by the cessation of the Imperial Government purchases of the Dominion's main primary products arising out of war conditions. Wool, sheep-skins, meat, and cheese were decontrolled before the beginning of the new season; the butter contract was extended, but in its turn came to a close at the end of March. The period of stabilized values, which had proved a dominant factor in maintaining the prosperity of the Dominion, was thus succeeded by a return to all-round open market trading.

The season of 1920–21 arrived with apparent good prospects for the frozen-meat trade, but these soon proved unstable. This was the result, firstly, for a time, of a most unfortunate dispute regarding the wages of freezing-works employees, which prevented practically all the North Island works from opening before the New Year; and, secondly, owing to apparently uncertain forward market conditions in England and consequent pessimistic forecasts, which caused a rapid reduction from the prices of stock ruling immediately after the New Year. As time went on this slump proved to have been premature, as values, except for beef and heavy mutton, remained steadily at a good level in the London market for months afterwards.

The wool-market exhibited a marked change when the new clip came forward for sale. Under the conditions created by the Imperial Government purchasing contract prices had been good, but the purchased wool had not gone into consumption at anything like the rate of production. Sellers of the new (1920–21) clip found themselves faced with a market heavily depressed by a large accumulation of Government-owned wool, and values fell to a much lower level, especially for crossbreds, which form the bulk of our wool-production. The values ruling at the opening of the season, however, were relatively good when compared with those which were later obtainable. In order to strengthen the marketing position in the interest of the growers, Wool Industry Regulations were framed and brought into operation in June last, together with an officially appointed Wool Committee. This authority, working in co-operation with the "Bawra" organization, is now exercising a very beneficial control.

Both meat and wool producers had to face a further serious handicap in the heavy charges for freezing and shearing, and in the high freight-rates for shipment to overseas markets. The freight-rates especially gave cause for serious concern, and, while the cost of running and maintenance of shipping was undoubtedly high, a general feeling existed that the regular shipping-lines, which had given good services in pre-war times at reasonable rates and had admittedly made good profits during the war period, were not exhibiting the full measure of consideration for producers which might have been expected when everything was taken into consideration. This feeling became accentuated when freight-rates for non-refrigerated vessels in other trades fell heavily, while those for refrigerated tonnage remained practically unaltered. The experience was such as to bring home forcibly to producers their dependence upon overseas shipping services, and the natural result has been a strong movement for the establishment of a Dominion owned or controlled line of refrigerated vessels, which is still in progress and contains great possibilities.

Apart from the question of freight-rates, the existing shipping-lines provided a satisfactory service with sufficient refrigerated tonnage during the season. It was found necessary, on decontrol of refrigerated space by the Imperial authorities, to make a meat-freight contract with the shipping companies, covering the period up to 31st August, 1922, this being effected through the agency of the associated freezing companies. The dairy industry representative organizations also made similar forward freight-rate arrangements for butter and cheese.

It may be rightly claimed that the dairy industry "saved the situation" for the Dominion in the past year. With a high-water-mark price of 280s. per hundredweight from the Imperial Government for the bulk of season's output of butter, the industry responded in remarkable fashion, almost doubling the production as compared with the preceding season, and setting up a record for annual output. Cheese-manufacturers were also favoured with higher ruling prices than anything heretofore recorded, and, notwithstanding an extensive turnover to butter, the output of cheese was well maintained at near the previous season's big volume of production. These results were obtained in a season in which weather conditions were by no means uniformly favourable for dairying. The production of dried whole milk also showed some increase, while the manufacture of skim-milk powder was commenced on a good scale. Condensed milk, sugar of milk, and casein also contributed substantially to the production of milk-products comprised within the dairy industry. The part taken by the industry in the economic and trade position of the Dominion is well represented by the export statistics for the twelve months ended 30th June last (a period which covers the seasonal movement better than the official year), during which the shipments of butter and cheese were valued at £16,823,693 out of total exports of £50,831,881, or over 33 per cent. of the latter. To this may be added, in round figures, another million for the other milk-products mentioned.

Arable farming, with special reference to grain-growing, made a good showing for the season as regards area and yield. There was an excellent wheat-yield of over 31 bushels per acre, with the result that no further purchase of Australian wheat has been necessary. The wheat-growers received a good guaranteed price, the substantial amount of money thus distributed proving of timely assistance

in many of the mixed-farming districts of the South Island. Oats and barley, unfortunately, met depressed markets. Prolonged droughty weather, which was experienced by certain districts during parts of the season, fortunately did not affect the cereal or other main crops to any great extent.

In regard to the lesser industries, fruitgrowing experienced a fairly good year, and the export of apples to the British market was renewed, with encouraging results. Growers were guaranteed a minimum return on these shipments, but in no case was it necessary to make any payment. The trade with South America remained in abeyance, chiefly owing to the present rarity of sailings by the Cape Horn sea route. It is satisfactory to note, however, that more sailings by this route are now arranged. The poultry industry has made progress in spite of the handicap of high-priced and often scarce feedstuffs. The greatly increased wheat-production anticipated for the ensuing season should ease the position materially in this respect. Beekeeping and honey-production continued to advance. Although export prices fell from the abnormally high level which had ruled for some time, payable prices were obtained. Moreover, the local market is being more fully and profitably developed.

Several noteworthy features attach to the live-stock position. The 1920 enumeration of sheep disclosed a heavy decrease of nearly two millions in the country's flocks, and this has been followed by a further substantial fall in the past year. Altogether in the last three years there has been a reduction of over three million head in our sheep stocks. This movement is ascribed to several contributing causes, among which may probably be included over-exportation in connection with the frozen-meat trade of late years. Thus for the twelve months ended 30th April last the mutton and lamb shipped totalled approximately no less than ten million carcases, while in the same period of 1919–20 the number was the also high one of some eight millions. In these exports, particularly as regards the first period specified, were included war and post-war accumulations; nevertheless depletion of sheep stocks is also indicated by the figures. A large increase recorded in dairy cattle corresponds with the steady expansion of the dairy industry. The cow is no doubt in many places trenching on what was until recently regarded as mainly sheep-country, this being another factor in the sheep-shrinkage. One satisfactory feature in the 1921 sheep returns is a good increase in breeding-ewes, which should help towards restoring the former level of the flocks. By better farming the country should be capable of maintaining a full quota of sheep on a lesser area. With regard to pigs, after a decline extending over several years, an upward movement seems to have become established. The statistics for 1919–20 showed a good increase, and this has been followed by another substantial increment for last season. It may be noted that this satisfactory development has coincided with the Department's special instructional activity in swine husbandry.

Dealing with the position and prospects of the farming industry in general, I am firmly of opinion that a reasonable optimism is justified, even as regards the pastoral section which has had such a severe setback. That the present world stocks of wool are not so abnormally heavy as may have at one time appeared is indicated by the recent gradual rising of the market. Again, the statistical position of the world's sheep stocks, showing very heavy reductions in the last few years, supports the view that a return to a fair remunerative level of wool-values cannot be long delayed, especially with a gradual resumption of more normal conditions on the Continent of Europe. As regards meat, our special lines—lamb and mutton—were at the close of the period reviewed still commanding well over pre-war prices on our best permanent market, that of the United Kingdom. Other lines can be brought within the present margin of profit by a reduction in ocean freights and freezing and handling charges. To mention one factor, undoubtedly great economies could be affected in shipping-costs by a better organization in the collecting and loading of outward cargo at the many ports and coastal roadsteads of the Dominion. As regards freezing-costs, apart from the question of actual wage-rates, labour could materially assist by getting back to pre-war individual output. The prospects of the dairy industry, while not at last season's peak level, are for good returns in the coming season. Decrease in prices promises to be largely made up by further increase in output. Most other lines of export produce seem assured of fair returns or are steadily improving their position.

What is commonly termed the "slump" may be not altogether without its redeeming features. It has checked the land boom with its excessive capitalization of farming property, has caused more land to be put under the plough for cropping, and has given an impetus to extended co-operation among the producing interests. In regard to the last item, important projects in co-operative marketing, &c., are now being formulated or studied. Greater efficiency, better farming, and co-operation on the part of the farming community can go a long way towards countering any vicissitudes in world trading.

A plea may be here made for a better mutual understanding between "town" and "country." Urban and rural interests are in reality interdependent, and frank discussion and study of respective viewpoints will go far to remove antagonisms. Contrary to much popular opinion, it may be fairly stated that during the war and immediate post-war period our farmers in general did not receive excessive returns from legitimate farming operations. The cause of the high cost of living, which has undoubtedly pressed on the urban population, must be looked for in other directions. As regards industry within the Dominion, while encouragement and proper support to secondary industries is desirable, it should be fully recognized that a strong maintenance of primary production must for many years to come be the leading factor in the ability of the Dominion to pay its way internationally.

An event worthy of mention is the establishment during the year of a fully organized State Forest Service, forestry being closely allied to agriculture. It is satisfactory to note that the new Department is recognizing the important auxiliary part which may be taken by private forestry and arboriculture, also the great benefit to be derived by the countryside generally from adequate shelter and windbreaks. The dissemination of information to farmers on tree-planting and kindred operations by means of lectures, literature, &c., as well as the supply of trees at moderate rates, has been systematically undertaken by the Forest Service, and tangible beneficial results cannot fail to show themselves in the near future.

The Board of Agriculture has continued to render valuable service, many important matters having been referred to it for advice and recommendation. The joint matured experience of the Chairman and members of the Board brought to bear on difficult agricultural questions under consideration affords much assistance and support. As usual, the annual report of the Board is printed as a separate paper.

A committee, known as the Producers' Committee, was set up during the year for dealing specially with the shipping and wool questions, together with other matters affecting producers which required special attention for the time being. This committee has done good work, and its services are highly appreciated.

With reference to the activities of this Department in the wide field of agriculture during the period under review, a full presentation of the work will be found in the accompanying report of the Director-General and the various branch reports appended. I would specially endorse the remarks of the Director-General on the subject of the agricultural instruction service and practical farm-school courses. During the year a clear understanding was reached with my colleague the Minister of Education, defining the respective spheres of each of the two Departments in the matter of agricultural education. In regard to the question of experimental stations, my policy favours an extension of local subsidized farms of moderate size and well-defined scope, supervised by the Department, rather than the multiplication of necessarily more expensive full departmental establishments.

In conclusion, I may claim that the Department has set out to show the practically scientific way to success in agriculture, and I believe it is achieving its purpose. No better expression of appreciation of the work of the staff as a whole is needed on my part.

W. NOSWORTHY,
Minister of Agriculture.

REPORT OF THE DIRECTOR-GENERAL.

The Hon. Minister of Agriculture. Wellington, 15th September, 1921.

I BEG to submit the following report on the work of the Department during the year ended 31st March, 1921, together with the detailed reports furnished by the various branches and forming the appendix hereto :—

During the period under review the various activities of the Department were maintained at full pressure—in fact, its resources have been strained to meet the calls for extended services in various directions. In these circumstances, some corresponding expansion in the professional or expert and also the related office staffs has been unavoidable.

The agricultural instruction service initiated as part of the scheme of reorganization of the Department two or three years ago has continued to make progress, and its value is being more fully realized. With agricultural instruction for pupils attending primary and secondary schools, and for students of colleges of university rank, the Department of Agriculture is not directly concerned, this naturally coming into the sphere of the Education Department; but to all who have completed their ordinary education, and are either proposing to make farming their livelihood or are already engaged on that enterprise, this Department must of necessity become the training and instructional centre. In a conference held during the year between this Department and the Education Department it was agreed that the practical training of pupils after they had left school, and extension instruction to farmers, were properly the functions of the Agriculture Department. The training of young men to become proficient farmers can perhaps be best carried out by means of the establishment of farm-schools where the practices of modern farming may be taught. Such institutions are clearly of great importance, and it is hoped to make the present experimental farms function as permanent farm-schools so soon as it is practical to do so. This would prove of great benefit towards the development of New Zealand agriculture, but, in addition, many of the farmers of the country are showing a strong desire for instruction and technical advice on agricultural matters. In other words, the necessity and demand for agricultural extension work is widespread and insistent. It is not unusual to hear statements to the effect that the great development of agricultural extension by means of skilled agricultural instructors or advisers which is occurring in Europe and America indicates that New Zealand is lagging behind in this respect. The comparison is, however, rather unfair, because, although our actual agricultural instruction service may be weak numerically, instruction and extension are by no means confined to that special branch. One has only to consider the extensive instructional activities of the Live-stock, Dairy, and Horticulture Divisions, and that of the Chemistry and Biology Sections, to realize that the Department is fully seized of the importance of such work.

Doubtless, however, the great weakness in our extension activities hitherto has been the fact that specialization in instruction in some particular phase—such as, for instance, control of animal-disease, herd-testing, dairy technique, fruitgrowing, and the like—has outstripped instruction in perhaps the more fundamental activities of farming — namely, crop-production, crop-utilization, and farm-management generally. It is in order to remedy this deficiency in the instructional work of the Department that I feel the necessity for further strengthening the agricultural instruction service, which has remained under my direct supervision with the valued assistance of Mr. A. H. Cockayne and Mr. B. C. Aston.

Development of agricultural instruction work through capable and efficient instructors, combining sound practical farming knowledge with good knowledge of scientific agriculture, must prove of greater practical value to primary producers than the operations of experimental farms. During the year three Instructors have been appointed to the staff, this representing an increase of one, as there was one resignation and one retirement. It is to be hoped that the staff will be considerably further strengthened in the near future, for at present the districts allocated to the respective Instructors are far too large for them to be able to cope adequately with the many demands that are made on their services. Further remarks on the work of this service are made at the head of the report of the Agricultural Instruction and Experimental Farms Branch, forming part of the appendix.

The Department has continued to co-operate in controlling the working of a number of farms constituting or forming part of institutions administered by other public Departments. The Avonhead Training-farm of the Repatriation Department has been controlled by the Director of the Live-stock Division, Mr. A. R. Young. The Superintendent of Experimental Farms, Mr. J. L. Bruce, in addition to supervising this Department's three main experimental farms, has acted in an active advisory capacity to the Queen Mary Hospital farm (Hanmer Springs) and the Burnham Military Depot farm (Defence Department), the Pukeora Sanatorium farm and Otaki Sanatorium farm (Health Department), and the Tauherenikau Training-farm and Moa Seed-farm (Repatriation Department). He has also controlled the Smedley Estate, in Hawke's Bay, on behalf of the Public Trust Office.

The Live-stock Division, with its extended scope, has worked efficiently. In connection with the health of live-stock in the Dominion—which remains on a high comparative level as regards freedom from serious disease—it is satisfactory to note that the records of the Veterinary Laboratory indcate a diminution in the occurrence of contagious mammitis. Condemnations of stock for tubercular affection at abattoirs, meat-works, &c., also show a reduction, especially in the case of cows.

Condemnations by Stock Inspectors on the farms or in the sale-yards are also slightly lower. Active measures have been taken to deal with ticks infesting cattle, and extended regulations are under consideration—the fortunate entire absence of tick-fever in the Dominion not being allowed to deter activity in these precautionary measures. Dips and dipping are increasing steadily in the districts affected. Contagious abortion in cattle is still the cause of considerable trouble and loss to dairy-farmers, and new methods are being adopted in dealing with it. With the continued steady and substantial increases in cattle, due to the expansion of the dairy industry, maintenance of health in the herds throws an added responsibility on the Department, and the importance of maintaining a strong experienced staff in the Live-stock Division should need little stressing.

The meat-inspection service was well maintained throughout the year, the men who had been engaged to take the place of Inspectors who had joined the Forces during the war having become experienced and well trained. Owing to the difficulties with which the commercial side of the industry had to cope as a result of unavoidable congestion of stores and delayed shipment, much attention had to be given to the condition of meat held too long in store. In this matter our departmental officers worked in conjunction with the Department of Imperial Government Supplies, and met the position in the best way possible under the circumstances. It is specially satisfactory to note that, in spite of extra work thrown upon the inspection staff, efficiency in the matter of preventing any diseased meat going into the stores for export was fully maintained, there being an entire absence of any complaints on the point from the marketing end. The inspection in public abattoirs of meat for local consumption was maintained on the same high level of efficiency as heretofore.

The Poultry Instructors attached to the Live-stock Division had an extra-busy year, this being largely due to renewed development of the poultry industry after the set-back of war conditions. The Department is handicapped in its poultry service and investigation work owing to the out-of-date nature of the equipment at the Milton Poultry-station, while a large portion of the Ruakura plant is also of this description. As soon as financial considerations permit, radical renewals will have to be undertaken at both places.

The rabbit nuisance is still in evidence, although much successful control work has been accomplished. A feature of the year's work generally was the big and largely increased demand for rabbit-poison from the Department's depots, this being so great as to cause the supply to run short in some cases. It is very satisfactory to record an increase in the number of local Rabbit Boards. Amending legislation dealing with this matter and extending the facilities for the formation of Boards was enacted in the session of 1920.

As regards noxious-weeds control—one of the present functions of the Live-stock Division—some good work has been carried out. An amending Bill to the Noxious Weeds Act, designed for the better working of that measure, is under consideration.

The Dairy Division had the task of handling a record output of dairy-produce and of meeting expanding activities at all points. In this it acquitted itself well. During the year the grading system was amended by the institution of a small charge for grading butter and cheese on a per-package basis. The service of free grading had been introduced in the early days of the industry when the latter was still in a struggling condition. With the growing prosperity of the industry, together with the necessity for securing revenue for other allied purposes, it was obvious that the time had arrived when the grading system should be made self-supporting. There has been a satisfactory development in farm-dairy instruction, the special purpose of which is to get down to the working base of the industry in the milking-sheds and intermediary stages of the raw material between farm and factory. At the close of the year nineteen such Instructors, appointed and paid in co-operation with dairy companies, were at work, but more are called for to cover the field. The necessity for the utmost care in the cleanliness of milking-machines would in itself justify this service of inspection and practical advice. As regards the ordinary service of instruction in dairy factories, improved quality of both butter and cheese submitted for grading afforded practical evidence of its maintained usefulness. The application of the advice tendered to the factories for some years past in connection with the pasteurization of milk for cheesemaking and the subsequent cool-curing of the cheese has also proved valuable. A factor in improved quality of butter has been the steadily increasing adoption of the system of cream-grading as consistently advocated by the Division. The tendency of some factories to run too close to the legal limit of the moisture content of butter has resulted in the discovery of instances of excess moisture, and legal proceedings may be necessary if the practice in question is not ameliorated.

The popularity of the certificate-of-record system of testing purebred dairy cows, controlled by the Dairy Division, was demonstrated by further increases in entries on the part of breeders and others, necessitating an increase in the testing staff, and charges have had to be raised to meet part of the increased cost of operation. The association system of herd-testing, for the greater part promoted and recorded by the Division, has also shown a marked expansion. Both these activities have accounted for a good deal of additional clerical work at headquarters.

The Horticulture Division has experienced a very busy year in connection with its various functions. The Division takes an intimate leading part in relation to the fruitgrowing industry, which at the close of the year was operating some 30,000 acres of commercial orchards. The services of the Orchard Instructors are in great demand, and the amount of advisory and inspectional work carried out by them makes a very large aggregate. The very substantial development of the industry in Nelson necessitated the formation of an additional instructorate in that district. After a break of several years, due to war conditions, the export of fruit (mainly apples) to the British market was renewed successfully. The Division took an active part in this matter as administrating the new fruit-export regulations, which are mainly designed to ensure proper standardization and high quality

in oversea shipments. Regulations relating to the sale of New-Zealand-grown fruit for consumption within the Dominion were also brought into force, and have received the good will of growers as being in the best interests of the industry.

A good volume of experimental and demonstrational work of many kinds was carried out at the several horticultural stations and experimental orchard areas. A heavy demand was made on the resources of the Division in connection with the fireblight outbreak, energetic steps towards the control of this disease in the Auckland District being taken in conjunction with a local committee formed for the purpose. As a result of investigation and observation it has been fairly established that complete control of fireblight in infected commercial areas cannot be secured without the elimination of the host-plant hawthorn, and steps were initiated to deal with this difficult question. During the year regulations were brought into operation prohibiting the movement of certain plants and of bees from the Auckland District, this being aimed at preventing the spread of the disease.

The apiary branch of the Horticulture Division has maintained close touch with the beekeeping industry by means of inspection and instruction, training, and the issue of certificates in beekeeping, the rearing and sale of queen-bees, and the grading of export honey. The registration of apiaries has proceeded steadily, but legal proceedings had to be taken against several confirmed defaulters. Power was given by the Apiaries Amendment Act, 1920, to make regulations providing for a registration fee for apiaries, the revenue to be devoted to the furtherance of the industry.

The Chemistry Section has carried out a large amount of sound work in its sphere — soil-investigation, matters connected with the development of our limestone resources, and fertilizers being among the most important activities. Increased action was taken as regards the administration of the Fertilizers Act, and in some cases legal proceedings had to be instituted against vendors for breaches of the law. An amending Bill, strengthening the law in several important respects, is being prepared for introduction to Parliament. The matter of legislation dealing with artificial stock-foods, also insecticides and dips, is under consideration. It has been arranged to proceed with the voluntary registration of sheep-dips in the meantime. Steps have been taken, in conjunction with the Live-stock Division, for the testing and maintenance of efficiency of cattle-dips used in connection with tick-control, and among the new lines of work undertaken by the Section may be mentioned the testing of New-Zealand-grown wheats for flour-quality and yield (a model mill having been acquired for the purpose), also the analysis of casein for export. The work done in connection with lime-supplies deserves special mention. The committee established in the preceding year—consisting of Mr. Furkert, Engineer-in-Chief of the Public Works Department; Mr. Morgan, Director of the Geological Survey; and Mr. Aston, head of our Chemistry Section—is doing valuable service.

During the year the quarters of the Biology Section were removed from the Central Development Farm, Weraroa, to Wellington, where the Biological Laboratory has been re-established under very much improved conditions. Branches are devoted to seed-testing, agronomy, plant-pathology, mycology, and entomology, and with a strengthened professional staff the Section is now in a position to further develop its work for New Zealand agriculture, using that word in its comprehensive sense. Specially efficient investigational work has been done in connection with the organism of fireblight, while in the entomological branch useful studies in the life-history and occurrence of the grass-grub, the sheep maggot-flies, and the pear-leaf-curling midge were outstanding features. In connection with the occurrence of the powdery-scab disease of potatoes the Biologist formed one of a small delegation sent to Australia to endeavour to have the embargo on the importation of New Zealand potatoes removed. While in Australia he also took the opportunity to visit the Maffra beet-sugar factory, operated by the Victorian Government, and to look into the beet-sugar industry generally. The question of establishing the industry in New Zealand was at that time receiving considerable attention, but with the subsequent fall in sugar-values the activity of the movement has largely diminished. The volume of work carried out by the seed-testing branch constituted a record as regards the number of samples tested for purity and germination. The special investigation in regard to the loss of germination of Chewing's fescue exported was continued in co-operation with the United States Department of Agriculture, but has not yet reached finality.

The work of the Publications Section has proceeded steadily, but the extremely high cost of printing generally has imposed limitations on extended activities. The main effort continues to be concentrated on the *Journal of Agriculture* as the best means for the dissemination of information and as a semi-popular scientific record covering the various branches of New Zealand agriculture. The value of the *Journal* to the rural interests of the Dominion has received renewed testimony from several quarters of late.

The grading of hemp again shows some shrinkage owing to the decrease of output of fibre, due to various causes. A noteworthy item, however, was the strong demand and correspondingly increased price for tow for export, suggesting extended uses for this by-product. During the year one or two conferences were held by representatives of the Department and the milling industry regarding special points of complaint in connection with preparation of the fibre, and it is anticipated that a higher general standard of quality will result. The so-called yellow-leaf disease of phormium, which continues to be a serious menace to the industry in certain districts, has been the subject of special research in the Biological Laboratory. A fungus has been isolated and is being investigated in order to determine, if possible, whether it is the cause of the disease. The most hopeful means of control appears to lie in the development of disease-resistant strains of phormium.

During the year the Chief Grain Grader continued to hold the position of Assistant Wheat Controller, with headquarters at Christchurch. As, however, the Grain Graders holding licenses to issue Government certificates have been made Graders under the Wheat Trade Regulations, their work has come more under the supervision of the Chief than would otherwise have been the case.

The whole question of the grain-grading service is under review, and various recommendations for improvements in system are receiving consideration.

In my last year's report reference was made to the co-operation effected by the Department with Canterbury Agricultural College in connection with the seed-improvement work carried out at the College, particularly as regards wheats. The related work of pure-seed maintenance and distribution had been carried out during the past few years by the Canterbury Seed-growers' Association, but this business had outgrown the capacity of that organization. It was therefore arranged that the Department should take over the work of crop-inspection and seed-distribution. The work was placed in charge of the Instructor in Agriculture, Christchurch, and a large quantity of certified pure wheat-seed has been distributed among growers at practically cost price. This development promises to be of very great practical benefit to wheat-production in the Dominion.

After somewhat lengthy preliminaries the transfer of the Pacific Phosphate Company's interests in the phosphate deposits on Nauru and Ocean Islands to the Governments of the United Kingdom, Australia, and New Zealand was duly effected as from 1st January last, and the Commissioners appointed by them now have full control of the undertaking. The New Zealand Commissioner is Mr. A. F. Ellis, a gentleman possessed of lengthy experience of the phosphate industry of the two islands, who has made his headquarters at Auckland. The Department of Agriculture has been entrusted with the responsibility of controlling at this end the supplies of phosphate from Nauru and Ocean Islands.

It was a matter for the deepest regret that Mr. D. Cuddie, Director of the Dairy Division, had to give up official duty on account of serious ill health. He was a most capable officer, whose work throughout had been of the highest standard, and his cessation from duty constituted a heavy loss not only to the Department, but also to the dairy industry. Fortunately, a highly efficient officer, Mr. W. M. Singleton, was available to carry on.

In concluding this brief review of the more salient features of the Department's work I must express my sincere appreciation of the efficient support accorded to me by the Assistant Director-General, the heads of Divisions and Sections, the Superintendent of Experimental Farms, and the staff generally.

C. J. Reakes, D.V.Sc., M.R.C.V.S., Director-General.

APPENDIX.

CONTENTS.

LIVE-STOCK DIVISION.

REPORT OF THE DIVISIONAL DIRECTOR.

The Director-General. Wellington, 24th August, 1921.

I FORWARD herewith my annual report for the year ended 31st March last.

A. R. YOUNG, M.R.C.V.S., Director.

INTRODUCTION.

In presenting my annual report it is necessary that I should touch briefly on the position of the market, as affecting the pastoral community, brought about by the rather sudden and unexpected severe fall which took place towards the close of the financial year. This has had a serious effect on the export trade of the Dominion in pastoral products, and it is difficult at the present time to forecast with any degree of accuracy what will be the trend of values for our primary products—meat and wool in particular—in the immediate future. For a country like New Zealand, which depends for its very existence on the products of the soil, it is imperative that a ready market be at all times available for its produce, and the fall of this market at a time when good returns are most required is a matter of grave concern. I am hopeful that the position will soon show a recovery, but at the same time anything that can be done at this end (and followed up at the marketing centres) to assist a recovery should be carried out, and that quickly. A great deal could no doubt be done here to avoid waste —not only waste in the handling of the products where labour-saving appliances might with advantage be adopted, but in other directions. The endeavour should be uppermost among all concerned to put our products on the market in as sound and good condition as possible. In the case of meat much can be done in this direction by producers, by the employees who kill and dress the carcases, and by the men who do the subsequent handling until the meat is on board ship. Unfortunately, we do not always find the necessary pride and pleasure in work well done which should permeate all concerned, and general co-operation to bring about and carry into effect all proper requirements is a step eminently to be desired.

As stated, much can be done here. The starting-off point must, of course, be with the breeder, and whatever the breed he should always aim at the best, and having started right in this direction see that his stock are well done by throughout. Adequate winter feeding, and, in districts where drought conditions are liable to occur, the provision of a reserve of food material, together with good shelter, are necessary adjuncts to successful production which are too apt to be neglected—in the North Island at least. It is surely infinitely better to end the winter with the stock in a good and healthy condition, and a haystack to spare, than to just manage to bring the stock through in a weak, low condition, and with no feed in hand for the next emergency. Yet this is how many farmers in New Zealand carry on their farming operations from year to year, and wonder how it is that they remain struggling while neighbours are prosperous. The climate of New Zealand so admirably lends itself to the raising of stock with the minimum amount of trouble that we are inclined to trust to Providence overmuch, forgetting that while taking every advantage of what Nature has provided for us we should duly assist her provision. By increasing our opportunities in this way we not only help ourselves, but the country receives the maximum benefit from our presence and activities.

CONDITIONS OF STOCK GENERALLY.

The conditions obtaining in the areas of the District Superintendents are summarized in the following matter :—

Auckland District.

The autumn of 1920 was very mild, and as a result of this and the good rains which were experienced during and after February, the farming industry commenced the winter under most favourable circumstances—with pastures in good order, stock in good condition, a fair supply of hay, and root crops at least equal to the best that have been obtained for many years. The winter proved mild, and all classes of stock came through it well, the mortality from all causes being very much below the average. Spring and early summer were very favourable, the season up to about the middle of last February being probably the most favourable experienced for many years for all branches of farming. From then onwards until the end of March the weather was very dry, as a result of which

the autumn growth of grass has been small, and root crops, particularly in the Waikato district, suffered to such an extent that good yields are likely to be the exception.

The general health of horses during the year was satisfactory. The number offering for sale, particularly of heavy draughts, has been barely sufficient to meet the demand, and the high prices which ruled during the year ended 31st March, 1920, have been generally maintained during the past twelve months. The keen demand and high prices have given the breeding of heavy horses a fillip which was much needed.

The condition and general health of cattle during the year under review have been above the average, and the mortality from all causes has been light. As a result of the mild winter and an ample supply of winter feed, dairy cattle came into profit in good condition, and this, combined with the excellent spring and summer seasons which followed, has resulted in one of the most successful dairying seasons yet experienced in the Auckland Province. All classes of cattle were in keen demand at satisfactory prices in April, 1920, and values continued firm, with a gradual rise to almost the end of September, when values for all classes except dairy cows commenced to decline—at first slowly, but during the last three months rapidly—until now all classes of beef cattle are difficult to quit even at prices approximately 30 per cent. below those ruling at the commencement of the period here reported on.

Sheep generally have done well during the year. Climatic conditions were very favourable, and the percentage of lambs was high. The latter did particularly well, and a greater percentage than usual became prime for slaughter or pasture. The wool-clip was fully up to the average in both weight and quality. All classes were in keen demand at high values in April, 1920, and this condition continued up to about October when prices commenced to decline. until, at time of writing, practically all classes are difficult to sell at a reduction of approximately 45 per cent. on the values which ruled at the opening of the period.

The condition and general health of swine has been satisfactory, and there is nothing regarding them requiring special mention. During the year under review there was a drop in the values of swine averaging 38 per cent. for all classes.

Wellington District.

Throughout practically the whole of the East Coast districts droughty conditions have prevailed during the summer and autumn months, with consequent bare and dry pasture lands. Poverty Bay district commenced the season with good rains and an early spring, but during the months December to April little rain fell and pastures dried up rapidly, resulting in a falling-away in the condition of stock. Hawke's Bay also commenced the year with good promise, but another drought-stricken summer and autumn followed, and though stock maintained their condition fairly well the prospects for the winter and early spring are not good. Last year large numbers of stock, chiefly cattle, left this district for the west coast and northern districts, and have not yet been replaced. The Wairarapa likewise suffered severely from want of rain, and the hot drying winds during the summer and autumn, with consequent withering-up of pastures, brought about a shortage of feed. Feilding district commenced the season with good spring and early summer pastures, but had an abnormally dry late summer and autumn, the pastures and root crops suffering severely. At early winter the fields were very bare. Taihape district, though not having the prolific and abundant pastures of other years, came through the season without serious shortage of feed. In the King-country pastures were good generally. Nelson and Marlborough pastures remained fairly good generally throughout the year. Taranaki had ample pastures in the early part of the season, and much hay was stacked. The first three months of 1921 were dry, and pastures generally are now barer than usual.

The health and condition of horses have been good. The only diseases that have been reported are influenza and strangles, and in no case has either of these diseases appeared in a severe form. Except in the Masterton district the breeding of horses (both light and heavy) is practically neglected. There, however, the breeding of draughts is being carried out on progressive lines. There is a good demand in all districts for farm horses, and unless more interest is taken in breeding it will only be a few years before difficulties will arise in getting suitable animals for farm-work.

The general health of cattle in this district has been normal throughout the year, no outbreaks of any disease of a serious nature being reported. The number of cattle found affected with tuberculosis, actinomycosis, and other malignant growths, and condemned by Inspectors in the field, is slightly less than the previous year, but no marked decrease is shown, the figures being 1,503 for 1919–20, and 1,460 for 1920–21. In one herd at Hastings an outbreak of actinomycosis took place, sixteen animals being simultaneously affected; this was practically the only departure from normal conditions found. The market values of cattle unfortunately slumped heavily during the year, this slump being felt all over the Dominion. This decline, together with the drought and consequent bareness of pastures which prevailed during the summer and autumn months over a great portion of this district (chiefly in Hawke's Bay, Gisborne, and Wairarapa) and which left the cattle in low condition to face the winter, has been anything but encouraging to cattle-raisers, many of whom have been financially hard hit. Reports received indicate that a largely increased number of cows will be milked for dairy-factory supply during the next season, many farmers relinquishing sheep in favour of dairying owing to the heavy drop in wool-values and the good prices still offering for dairy-produce.

Sheep generally have remained healthy during the year, and the last wool-clip was considerably better than the previous one. The lambing was successful, and the percentage of lambs rather higher than in 1919. A number of cases of protrusion of the vagina were reported about last September, but inquiries made in all districts showed that it was not any more prevalent than in previous years. A few cases of facial eczema were reported from various districts, but in no case was there any extensive outbreak. Considerable mortality was reported from the Wairarapa and Woodville districts from acute renal congestion during the months of September and October, but since then no trouble has been experienced. A careful examination of all sheep at saleyards has been made, and where lice-affected sheep have been found the owners have been prosecuted. There appears to be very little doubt that in a number of cases the sheep found to be affected with lice had been dipped before being brought to the yards. That the dip has not been effective is in the majority of cases due to the carelessness of the owners in not carrying out the printed instructions sent out with the dip. Too many farmers look upon dipping as a matter of form, and either do not mix the dip properly or hurry the sheep through short dips so as to get the job finished. Owing to the dry weather and shortage of water a number of applications for extension of time in which to dip have been granted.

Two outbreaks of pasteurellosis have been reported—one from Kai Iwi, near Wanganui, and one from Carterton. In the first outbreak there were four deaths and in the latter eleven. The trouble was confined to the two farms on which the outbreaks occurred, and no further cases have been reported. Cases of paralysis in pigs have been reported from time to time, and in practically every case investigated the methods of feeding have been at fault. Pneumonia has also been reported in one or two districts, being attributed to the unsuitable conditions in which the animals have been kept. There is no doubt that the pig is a very much neglected animal on the majority of farms. When the price was high and pigs were well worth rearing very little was done for their comfort, but now the price has gone down considerably it is feared they will be more than ever neglected. Tuberculosis among pigs, as evidenced by the returns from bacon-factories and abattoirs, is still far too prevalent.

Christchurch District.

In several of the stock inspection districts—namely, Rotherham, Amberley, Christchurch, Timaru, and Waimate—a number of horses were noted during the year to be affected with strangles, but apparently this disease caused no mortality of any consequence. Apart from this trouble, the health and condition of horses in general have been good. The breeding of horses is progressive in about half of the district, while in the remainder it is at a standstill in some parts and very unprogressive in others. In farming areas draught horses are in good demand and are commanding satisfactory prices.

At the end of winter, cattle in the Waimate, Timaru, Amberley, Rotherham, and Kaikoura inspectorates were in fair to very good condition, while in the remaining portion of the district their condition was poor. At the

present time (end of March) the prospects for winter feed in the greater portion of the district are poor. In some parts the rape and turnip crops were practically failures, and it is to be hoped that we shall have a mild winter so that stockowners may carry their stock through. Throughout most of the districts winter feed such as hay, turnips, mangolds, straw, and lucerne is provided. No unusual disease appeared among cattle during the year. The Inspectors of Stock have been active in giving attention and advice where trouble has been encountered. Deaths among dairy cattle from all causes during the year in the various Inspectors' districts are estimated as varying from 2 per cent. to 5 per cent., and would probably average about 3 per cent. for the whole district. The percentage of calves kept is estimated in the different inspectorates at from 5 per cent. to 95 per cent. Mortality among calves under one year varies from 1 per cent. to 5 per cent., the principal causes being improper feeding, parasitic gastritis, and want of shelter.

The health and the condition of sheep have in general been good. It is estimated that deaths from all causes among adult sheep varied from 2 per cent. on the plains to 10 per cent. on the high country. The percentage of deaths among hoggets varied from 3 to 10. Lambing percentages were higher this year than last, while deaths among lambs from all causes up to weaning varied from 3 per cent. on the plains to 12 per cent. on the high country. The wool, when compared with last year's regarding weight and condition, appears to have averaged slightly heavier and was in better condition. In the Rotherham and Waimate districts it was considered to be lighter than last year. The condition of flocks as regards lice and ticks was evidently better in general than last year. The Inspector for the Ashburton district reports that a good number of ticks were showing in the wool as a result of faulty dipping. The Inspector for the Christchurch district reports that the condition as regards lice and ticks is very satisfactory, and he considers the improvement is due to the fact that very few "travelled" sheep have been coming into the local sales. The Inspector for the West Coast reports that in some parts of his district the condition of sheep in regard to lice and ticks is not satisfactory, as dipping in many cases is carried out in a careless manner, and during the year he has had eight prosecutions for exposing lousy sheep for sale and two prosecutions for failing to dip. In the majority of districts the dipping of sheep is carried out in a satisfactory manner, but the Inspector for the Amberley district states that in his district it requires a considerable amount of watching. The Inspector for Ashburton remarks that sufficient attention is not paid to the mixing of the dip. The Inspector for the West Coast states that in his district dipping is not carried out in a satisfactory manner in many cases. On account of dry weather the condition of sheep pastures in general at the end of the year (March) was not good, except in the West Coast and Ashburton districts and the back country of the Rotherham district. So far as the health of sheep is concerned, there has been very little trouble this year. Parasitic gastritis was noted in a few instances in the Christchurch district, but did not cause mortality of any consequence. In regard to renal congestion of lambs, the Inspectors and Veterinarians were advised to keep in very close touch with this matter with a view to further investigation being made, but fortunately, although cases were reported from the Ashburton, Christchurch, Timaru, and Fairlie districts, the mortality from this cause was small. In September, on account of the rough wet weather, there was some mortality among the lambs.

The health and the condition of pigs have been good during the year, and no unusual disease has appeared among them. Two of the Inspectors of Stock report that owing to the high prices ruling, especially at the beginning of the year, a number of farmers gave the pig industry more attention, and the number of pigs increased in their districts; but in general this industry is not progressive.

Dunedin District.

The season on the whole has been a favourable one for feed, although in the spring and early summer, owing to high winds and dry weather, the grass was not very plentiful; still, the health of stock generally has been good and we had no special outbreak of disease to contend with.

Strangles has been prevalent throughout the district, and little care is taken by stockowners to prevent its spread, either by isolation or by ordinary sanitary measures. The most common type was that of the formation of an abscess under the jaw, &c., but in many cases the animals suffered from sore throat, slight nasal discharge, and œdematous swelling, and these were generally rather protracted in their recovery. There were several cases of purpura reported from Southland, following on strangles, but I understand all recovered under treatment. Osteoporosis appeared in a stud of thoroughbreds in the Oamaru district, affecting three two-year-olds. A change of location was tried, but the result was negative. Very few cases of navel ill have been brought under our notice, partly due to the fact that farmers have not been breeding so many horses as formerly. However, owing to the high prices, a large increase of foals is expected this year. Few societies take advantage of having horses and mares examined at the agricultural shows, the only show where this was done voluntarily being at Ranfurly, where only two horses came forward, one being rejected. At Dunedin Parade and Invercargill Show it is necessary to have the stallions examined, because this is provided for in the competition for a special prize, otherwise little interest is taken in the soundness of breeding-stock. This, I think, is to be regretted, and I hope to see the time when all stallions and stud mares will have to pass an examination for soundness.

Cattle have on the whole remained in good health and condition, and the number of tubercular animals is found to have been slightly less than last year; but if the tuberculin test were more generally applied, especially in dairy herds, the disease could be greatly reduced. I think it is to be regretted that dairymen do not take more advantage of this method of detecting the disease than they at present do. Probably if a higher rate of compensation were allowed for condemned cattle not visibly affected it would be some encouragement for them to do so. Usually the only owners who ask for a tuberculin test are those with small herds or privately owned cows, when tuberculosis threatens or affects some of the family. The number of cattle tested was 113, being 17 for export (compulsory) and 96 for owners at their own request. Those tested for export gave no reaction; of the others four were found affected and destroyed.

Generally the health and condition of sheep has been good. Very few cases of renal congestion were reported last season. I presume the climatic conditions in the spring tended to prevent it. The condition of sheep regarding lice affection is certainly bad. Farmers evidently take little trouble or care in dipping their flocks, with the result that lousy sheep are common in all the saleyards. Proceedings have been instituted in most cases where sheep in saleyards have been found affected with lice, and, in addition to consignments being dipped forthwith by order of the Inspector, seventy cases were taken to Court and fines ranging from 10s. to £10 inflicted.

Animal-diseases.

Blackleg.—During the year some necessary alterations to the boundaries of the areas as defined in the Auckland District were made, but in other respects the regulations under the Stock Act affecting this disease remain as before, and were administered with the cordial co-operation of the owners of stock in the affected districts. The steady decrease of the past few years in the number of calves sent forward for inoculation has been again continued, being most marked in the Auckland District. The numbers of calves inoculated during the last four years ended 31st March are as follows:—

	1918.	1919.	1920.	1921.
Auckland	106,614	98,881	98,500	56,944
Taranaki	73,620	53,024	45,667	40,630

As before, the vaccine used was all prepared at the Department's Veterinary Laboratory, and the results were entirely satisfactory.

Contagious Mammitis.—This disease in cows does not appear to have been quite so prevalent throughout the dairying districts as formerly, and although a large number of samples of milk (739) from suspected cases were received at the Veterinary Laboratory for examination, only 169 were found to show the specific streptococci indicating the contagious form, while 143 proved the presence of other non-contagious forms. The fact of so many samples of milk from suspected cases of mammitis having been forwarded, and only a fairly small percentage of them proving to be from mammitis-infected cows, indicates that milking-machines have been the agency responsible for setting up udder troubles resembling mammitis. As milking-machines are also a big factor in the spread of the disease, it is necessary that the greatest care be taken to have the cups, &c., thoroughly cleaned and regularly sterilized, and the cows' udders examined by hand after each milking so that any abnormality might be at once detected and checked.

Contagious Abortion.—This disease is still giving considerable trouble, and is the cause of a considerable sum being lost to dairy-farmers and to the Dominion. I cannot get away from the fact that in spite of the pains the Department has taken during the past fifteen to twenty years to place before the farmer the best advice available regarding this disease, and the means to be adopted for its prevention and control, the loss is still much greater than it would be if farmers would only exercise a little more care, particularly when introducing new animals to the herd. I have heard of numbers of cases where it is alleged that although the treatment prescribed has been carefully followed out the disease continues to give trouble, but, on the other hand, I have also heard of numerous cases where success has followed on the treatment being energetically and honestly followed and every precaution taken as regards new additions to the herd. In a number of cases treatment is not taken up soon enough, and even when resorted to it is only because the initial carelessness has "come home" with telling effect in the loss of numbers of the herd for that season's dairying. The latest developments in the investigation of this disease in other countries are being closely watched, and investigations are also being conducted as regards the results of their findings.

Vaginal Catarrh.—Cases of vaginal catarrh have occurred in a number of the districts, but Manawatu appears to have contributed more cases than other localities. I am still of opinion, however, that more cases of failure to conceive are attributable to this trouble than have been definitely determined. In all cases where owners of affected herds have properly carried out the treatment prescribed by officers of this Division the trouble has been got over, but owing to the treatment necessarily extending over a considerable period many cows are lost for the season.

Tuberculosis.—I have again to report a decrease in the respective percentages of cows, bullocks, heifers, and swine found to be affected with tuberculosis in any degree on the examination of these animals slaughtered at meat-export works, abattoirs, and bacon-factories. The decreases in the various classes of stock are as follows: Cows, 2·09 per cent.; bullocks and heifers, 0·27 per cent.; swine, 0·34 per cent. On the other hand, bulls show an increase of 0·61 per cent. on the previous year's figures. A very encouraging feature of the above position is the substantial decrease shown in the percentage of cows found affected with tuberculosis when slaughtered. The condemnations for tuberculosis by Stock Inspectors on the farm or in the yards were 3,251 (a decrease of ten on the figures for the same period last year), this number being distributed among the District Superintendents' districts as follows: Auckland, 1,547; Wellington, 1,210; Canterbury, 362; and Otago, 132. A further analysis of the figures again shows Marlborough and Nelson cattle as being remarkably free of the disease, only five being condemned in the former and three in the latter districts for the twelve months. These districts are in an enviable position, and constitute an ideal ground for the commencement of a campaign with a view to the cleaning up of the herds of the Dominion as regards this disease. The importance of this step in maintaining the health of the community undoubtedly warrants the matter being taken up by instituting a tuberculin test of the cattle in these districts in the first instance, and maintaining the herds in a healthy condition by testing all new entrants to the district and retesting at regular intervals all the animals therein. This system could then be gradually extended to other districts offering suitable conditions. The initial expense involved in payment of compensation would no doubt be considerably greater than at present, but the results obtained would, I am sure, amply repay the Dominion, and the annual sum of over £20,000 which this disease alone now draws from the Consolidated Fund in compensation for cattle condemned would ultimately diminish; while in respect to the more healthy condition of cows generally the gain to the Dominion would not be estimated in money alone, but in the greater freedom from the risks of contagion passing to the human subject.

Actinomycosis.—This disease was responsible for the condemnation by Stock Inspectors of 550 cattle on the farm or in the saleyards, distributed as follows, last year's figures being shown in parentheses: Auckland District, 206 (158); Wellington District, 133 (102); Canterbury District, 80 (59); Otago and Southland Districts, 131 (135). It will be noticed that this disease is on the increase, ninety-six more cattle being condemned than last year. The District Superintendent, Dunedin, in his report states: "I note in regard to the prevalence of this disease that most of the cases in the high country are affected in the bony structure of the face, while those in the lower areas are affected in the tongue, the latter form being as a rule amenable to treatment. In this respect I find that 2 drams of potassium iodide given twice daily for ten days gives good results—better and quicker than the mercuric potassium iodide soloids." In the majority of cases the disease has been confined to one or two animals in a herd at the most, but the District Superintendent, Wellington, reports that in one outbreak near Hastings sixteen animals in one mob were found badly affected, and were condemned.

Cattle-tick.—During the year the regulations for the control of cattle-tick have been much more stringently enforced than during the previous year, and the construction of cattle-dips in the tick-infected areas has been considerably accelerated in consequence. The Government subsidy of pound for pound up to £150 towards the construction of public cattle-dips which are erected in conformity with the Government plans and specifications has been approved in connection with thirty-four dips. Of this number nineteen have already been completed, seven are in course of construction, and work has not yet commenced on the remaining eight. The plan on which the dips are being built has given general satisfaction, and those so far completed have been erected in a satisfactory manner. Stockowners and auctioneering companies in the tick-infested areas have co-operated well with the Department's officers in fighting the tick pest, and every endeavour will be made to ensure a continuation of this desirable condition. The practice of passing all cattle through a dip immediately prior to their being offered for sale at public auctions has become practically universal in the badly infested areas, and is freely submitted to by stockowners, notwithstanding that there is no provision in the regulations enforcing such practice. The beneficial effect which dipping has on the general health and well-doing of the cattle, quite outside its tick-killing qualities, is being recognized and appreciated by stockowners. During the past year advantage has been taken of every available source of information, for the purpose of ascertaining as accurately as possible just what localities are affected with tick, and our knowledge on this point is now fairly accurate. The necessity for strengthening and enlarging the scope of the regulations has been recognized, and the defining of areas for the better control of the tick within those areas, and for the protection of clean districts, is also being carefully gone into, nd recommendations regarding new or amending regulations towards this end will shortly be submitted.

Live-stock Statistics.

Sheep.—The enumeration of sheep in the Dominion as at 30th April, 1920, showed a decrease of 1,919,048 when compared with the figures for the previous year, this large decrease being accounted for by heavy slaughterings for export, a slightly reduced percentage of lambs, and the retention of less breeding-ewes for the upkeep of the flocks. The following table shows the number of sheep in the Dominion for the stated years :—

Year.	Stud and Flock Rams (Two-tooth and over).	Breeding-ewes.	Other Sheep.	Lambs.	Total.
1913	313,690	12,521,036	4,371,257	6,985,827	24,191,810
1914	321,869	12,920,176	4,377,936	7,178,782	24,798,763
1915	315,251	12,615,341	4,625,681	7,318,148	24,901,421
1916	316,131	12,892,767	4,682,298	6,896,954	24,788,150
1917	329,230	13,260,169	4,530,471	7,150,516	25,270,386
1918	325,111	13,022,034	5,295,269	7,895,888	26,538,302
1919	321,304	12,341,900	5,734,029	7,431,321	25,828,584
1920	306,583	11,568,549	5,723,459	6,315,915	23,914,506

The present year's enumeration (1921) shows a further decrease of 634,939, which means a total reduction of the flocks during the past three years of over 3,000,000, a matter for very serious thought.

Cattle.—The statistics collected in January, 1920, show a very satisfactory increase over the previous year in dairy cows and bulls, other cattle showing a slight decrease. The numbers in the respective classes are shown in the following table :—

Year.	Bulls (all Ages).	Dairy Cows.	Other Cattle.	Total.
1908	30,170	591,617	1,151,539	1,773,326
1911	40,670	633,733	1,345,568	2,020,171
1916	50,858	750,323	1,616,310	2,417,491
1917	49,930	777,439	1,747,861	2,575,230
1918	51,935	793,215	2,024,315	2,869,465
1919	56,706	826,135	2,152,637	3,035,478
1920	57,999	893,454	2,150,492	3,101,945

Swine.—The decrease in numbers of swine which has taken place for some years past has this year been arrested, and I am pleased to record an increase, as revealed in the last enumeration, of 31,482. The available figures since 1910 are as follows: 1911, 348,754; 1916, 297,501; 1917, 283,770; 1918, 258,694; 1919, 235,347; 1920, 266,829.

Horses.—The enumeration of horses in the Dominion taken in January, 1920, showed a continued decrease, the following being the figures for the past three years: 1918, 373,600; 1919, 363,188; 1920, 346,407.

Slaughter of Stock for Export.

The term of the contract with the Imperial Government for the purchase of all meat slaughtered for export expired on 30th June, 1920, and at that date a considerable quantity of meat purchased

under the contract still remained in store in the Dominion. The shipping position, however, had by this time become very much easier, and large quantities of Imperial meat, together with a proportion of "free" meat, were released from the stores, and any anxiety regarding freightage was removed.

Soon after the termination of the contract the market prospects for our meat became somewhat clouded, so that the new season opened with a great amount of hesitancy on the part of the buyers, and although lambs continued to be bought for slaughter at somewhat reduced prices, sheep were very slow of sale even at "giving-away" prices. The demand for mutton for the Home markets, except of the lighter class, was practically nil, and the prices offered were barely sufficient to pay freight and other charges at this end, let alone any margin.

As will be seen from the following table, a very substantial increase took place in the number of lambs, and a considerable decrease in the number of sheep and cattle, slaughtered at meat-export works (principally for export) during the twelve months ended 31st March, compared with the previous twelve months' slaughterings :—

	31st March, 1921.	31st March, 1920.	Increase.	Decrease.
Cattle	194,089	256,459	..	62,370
Sheep	3,671,182	4,658,897	..	987,715
Lambs	3,433,101	3,139,238	293,863	..

A new freezing-works which was in course of erection at Hicks Bay for the Gisborne Sheep-farmers' Freezing Company was completed during the year and commenced operations.

Inspection of Meat.

The inspection of all carcases slaughtered at meat-export slaughterhouses, abattoirs, and bacon-factories was carried out satisfactorily during the year.

The following are the numbers of each class of stock slaughtered under direct inspection during the year ended 31st March, 1921 :—

Cattle ..	305,363	Sheep ..	4,332,378	Swine ..	130,487
Calves ..	28,421	Lambs ..	3,537,235		

With the exception of lambs and swine, which show an increase in the number slaughtered, a decrease on the previous year's figures is shown.

The following table indicates the destination of the dressed carcases, those animals slaughtered at abattoirs being almost wholly for local consumption, and those slaughtered at meat-export slaughterhouses being intended (except in the case of swine) principally for export :—

	Abattoirs.	Meat-export Slaughterhouses.	Bacon-factories.
Cattle	111,274	194,089	..
Calves	21,896	6,525	..
Sheep	666,196	3,671,182	..
Lambs	104,134	3,433,101	..
Swine	64,002	40,590	25,895

At ordinary slaughterhouses the stock killed was as follows : Cattle, 61,202 ; calves, 1,887 ; sheep, 278,142 ; lambs, 26,735 ; swine, 13,189.

In addition, 26,024 carcases of pigs killed and dressed by farmers under the exemption clause of the Slaughtering and Inspection Act and sent in to butchers' shops and small bacon-factories were inspected by departmental officers. In regard to inspection of the carcases of pigs sent in to butchers' shops, I desire to point out that of the number examined 541 were condemned as being affected with tuberculosis. When it is considered that these animals had, before condemnation, actually reached the butchers' shops in the various centres, it should not need any comment to emphasize the necessity, as already pointed out by me, for an alteration in the Act as regards the slaughtering of pigs by farmers under the exemption clauses. That an amendment is necessary was recognized by the then Chief Veterinarian shortly after the passing of the original Slaughtering and Inspection Act in 1900 ; it has been pointed out on various occasions since, and I trust that an amendment will not longer be delayed.

Compensation paid for Stock condemned.

During the year under review compensation to the amount of £14,336 19s. 7d., on 4,322 cattle and one horse condemned and ordered to be destroyed under the provisions of the Stock Act, was paid out of the Consolidated Fund. Compensation paid for carcases or parts of carcases condemned on inspection at the time of slaughter, under the provisions of the Slaughtering and Inspection Act, amounted to £9,792 5s. 1d., making the total compensation paid under the Acts named during the year £24,129 4s. 8d., as compared with £27,048 for the previous year.

Importation and Exportation of Breeding-stock.

During the past year considerable numbers of valuable stud stock were imported by Dominion breeders, and their advent should be a valuable addition to the stock of the country. The following were the importations : Cattle, 66 (3 Shorthorn, 1 Hereford, 30 Aberdeen Angus, 14 Friesian, 17 Jersey, and 1 Red Poll) ; sheep, 452 (3 Romney Marsh, 7 Lincoln, 18 Border Leicester, 2 Southdown, 415 Merino, 1 Shropshire, 2 Corriedale, 1 Suffolk, 1 Ryeland, and 2 Wensleydale) ; swine, 35 (26 Berkshire, 6 Yorkshire, and 3 Poland China) ; horses, 112 (14 from United Kingdom and 98 from Australia) ; goats, 12 (including 6 kids). I am also pleased to record a considerable increase in the export trade in New-Zealand-bred stock for breeding purposes, particularly in dairy cattle and sheep, considerable

numbers of pedigree and grade dairy stock finding purchasers at prices satisfactory to the breeders. A large number of the latter were purchased for shipment to Java.

Destruction of the Kea.

The subsidy payable by the Government for the destruction of the kea was increased during the year from 1s. to 5s., and at once an increase in the number of kea-beaks presented to the Department's officers was noticeable. For the period prior to the increase—practically six months—927 beaks were paid for, while for the remaining six months 1,388 were brought forward and certified to.

Inspection of Dairies supplying Milk to Towns.

The inspection and registration of all dairies and herds supplying milk for town consumption has been continued during the year, and on the whole the premises have been maintained in a satisfactory condition. The dairies supplying milk to the cities and larger towns are necessarily given more frequent visits of inspection, and it is satisfactory to note that licensees as a whole show an endeavour to carry out any instructions issued with a view to ensuring that the utmost cleanliness obtains and the conditions such that all reasonable requirements be met.

The Veterinary Laboratory.

The work of the Department's laboratory at Wallaceville has consisted chiefly of the carrying-out of routine duties in the way of examinations of specimens forwarded, and some special investigations into certain diseases, notably contagious mammitis and contagious abortion.

As regards contagious mammitis several different methods of curative treatment have been tried, but the results obtained did not give very much encouragement in the belief that a cure for the disease might be looked for in any of the methods under trial. The work is, however, being continued. In the case of contagious abortion preparations for the manufacture of a vaccine were put in hand, but owing to the conflicting opinions entertained respecting its efficacy, and the practical difficulties of carrying out the method on the majority of farms in New Zealand, vaccination has not yet been officially advocated for this country. An interesting disease affecting the skin of cattle, and giving rise to serious symptoms attended by mortality, was investigated, and proved to arise from infection by a mould related to, though not identical with, certain forms of ringworm. An interesting investigation into mortality among cattle in Hawke's Bay was undertaken. Observations showed that a small parasite of the fluke species was responsible in determining the acute enteritis which is the dominant symptom of this complaint. Specimens of the parasite have been forwarded for identification to Dr. Sweet, Parasitologist, of Melbourne University, but up to the present no information as to the result of these observations has been received. This is the first time, I believe, that the three foregoing diseases have been recorded as occurring in this country.

An outbreak of blood-poisoning affecting sheep after shearing was investigated, and the cause of the trouble proved to be due to infection by the organism of malignant œdema present in contaminated soil. Cases of poisoning of sheep, proved by subsequent analysis to be due to absorption of carbonate of soda, came under observation.

There has been a notable increase in the requests for investigation and advice upon diseases of poultry. Cases of the disease known as "blackhead" of turkeys, and of coccidiosis of chickens, have been investigated and their nature definitely determined.

Milk samples to the number of 739 were received for examination. Of these 169 proved to be from cases of streptococcic mammitis, and 143 from other forms of mammitis. Fifty-eight samples of milk from Dunedin, Christchurch, Wellington, and Wanganui districts were submitted for biological tests for the presence of tubercle bacilli. It is satisfactory to record that no reactions were observed in the test subjects. A further 153 pathological and other specimens were examined for various conditions; these included samples of paspalum-seed, which were examined for the possible presence of ticks. The preparation of blackleg vaccine was again carried out at the laboratory, and 130,000 doses were distributed to officers engaged in the vaccination of calves against this disease.

The farm operations have been carried out by the Farm Overseer, who has devoted his whole energies to the maintenance and improvement of the farm property. The experiments in mutton-raising upon plots dressed with various artificial manures have been continued under the direction of Mr. B. C. Aston, Chemist, this entailing considerable labour in the fortnightly weighings, &c., of the sheep depastured on the plots. The results of these experiments have been recorded in the *Journal* by Mr. Aston.

Importation of Animal-manures.

As recorded last year, the want of shipping for the carriage of manures from Australia still results in considerable quantities of manures, prepared according to the requirements of the New Zealand regulations and intended for export to New Zealand, ultimately going elsewhere. This is much to be regretted, as very little animal-manure is now coming into New Zealand from Calcutta, our only other outside source of supply, and this makes it all the more necessary that the available supply in Australia be secured to New Zealand.

I append hereunder the report of the Inspector of Manure-sterilizing, Sydney, who has, as usual, carried out his duties with thoroughness and due regard to New Zealand's interests:—

The supervision of the sterilization of animal-manure at the nine mills licensed under the New Zealand Stock Act, 1908, regulations, has fully occupied my time, together with that of my assistant. Seven of these mills are located in the Botany district, one at Riverstone (thirty miles distant), and one at Footscray, Victoria. The system of inspection carried out was in all details the same as that followed during the past sixteen years. The limited amount of shipping-space available for manure during several months of the year, together with the stoppage of

steamers owing to the seamen's strike, materially lessened the quantity of fertilizer exported to the Dominion, but despite these obstacles 4,195 tons of manure were sent from the various licensed mills.

Regarding the work at the mills, I have at all times found the regulation steam-pressure well maintained for the full time demanded—in many cases longer. Generally speaking, the licensed premises have been kept in a satisfactory condition with reference to buildings, appliances, and surroundings. At two of the mills, however, I deemed it necessary to delay renewing the license until some urgent repairs and alterations, previously promised, are actually carried out. At one of these establishments very extensive additions are in course of construction, but will not be completed for another eight or nine months. Through lack of proper accommodation owing to this disorganization the manure, after sterilization, on several occasions of late has been allowed to come into contact with raw animal material of a dangerous nature. In consequence of this a large proportion of the output had to be rejected for shipment. A new manure-factory is provided for in the additional buildings. If, however, the company wish to continue preparing manure for New Zealand in the old premises in the meantime, it is essential that they observe the requirements of the regulations.

Last September a manufacturer in Tasmania notified me, through his Sydney representative, that he wished his works licensed as early as possible. The application form supplied was never completed nor returned to me, and inquiries since made lead me to much doubt the existence of any sterilizing-appliances in these works. Previous to the application for a license a shipment of 100 tons of fertilizer was sent from here to Auckland, the composition of which was superphosphate 84 per cent. and bonedust 16 per cent. Several inquiries reached me from mercantile brokers in Brisbane regarding the licensing of a number of meat-works; in each instance the manure had already been manufactured—in one case it was on a steamer *en route* from Messrs. Vestey's works, Darwin.

The quantity of raw material received at the mills has shown an increase on last year, doubtless owing to a more plentiful supply of cattle and sheep at the Flemington saleyards. None of the meat-canning factories in the vicinity of Sydney are now in operation; these in the past greatly augmented the supply of raw material at several of the licensed mills. Much of the supply of dry country bones now coming forward, upon which several of the mills are principally dependent, is from the remains of stock that perished owing to the drought conditions of the first half of last year, and to the unusually heavy flood rains which followed.

According to a summary compiled from the annual returns furnished by the Stock Inspectors of the various Pastures Protection Boards of New South Wales, there was an estimated decrease of 3,500,000 sheep and 80,780 horses at the commencement of the present year. Cattle, on the other hand, showed an increase of 2,830. The estimated totals for this State at the end of the year were—horses, 496,403; cattle, 2,854,877; and sheep, 29,901,701.

The manufacturers and speculators here took full advantage of the shortness of supplies and the demand from the Dominion in fixing their selling-price. All the old contracts have now been executed, and I am informed that much difficulty is being experienced in entering into new ones on anything like the former terms. Vendors recognize that future business will have to be done on a lower basis of profit.

I have pleasure in recording that throughout the year my assistant, Mr. Joseph Pearson, carried out his duties in a most satisfactory manner, and I also wish to acknowledge the invariable courtesy and assistance received from the Chief Inspector of Stock, Mr. S. T. D. Symonds, M.R.C.V.S., and his officers.

Sheep-dipping.

Prosecutions for exposing lice-infected sheep for sale are still far too common, and indicate that insufficient care is taken in mixing the dip and in dipping the sheep. It would almost appear that the object in view when instituting the dipping of sheep had been lost sight of altogether, and that dipping was simply a necessary matter of form with no desired object. In my report for 1919 I issued a warning to sheepowners that I looked upon this offence as a serious one, and intended to approve of prosecutions against offenders. I desire to repeat this warning.

Poultry.

Notwithstanding the extremely short food-supply for poultry during the past year, the industry has held its own better than the most sanguine could have expected. In the early part of the year, owing to the difficulty of securing foodstuffs and the price charged for them, the business of poultry-keeping looked to be almost threatened with disaster. The action of the Government at this time in allocating a large line of wheat for poultry undoubtedly served as a means of avoiding a most serious situation. With this wheat available, and by resorting to oat feeding as far as possible, the poultry-keepers were enabled to tide over the most critical time ever experienced with this industry in the Dominion. While foodstuffs have ruled at a high level of value, eggs have also maintained war-time prices. The latter is probably due not so much to decreased production as to an increased consumption. The better quality of eggs now marketed has undoubtedly created a much keener demand.

The Poultry Instructors have had an exceptionally busy time during the year, chiefly in regard to delivering lectures, giving demonstrations on culling and the selection of breeding-stock, answering correspondence, preparing literature, visiting plants, and giving advice on all branches of the industry. In addition, the work of establishing soldiers' training-farms, and giving special attention to returned soldiers who have started poultry-keeping on their own account, has added considerable extra work to the small staff of Instructors. So great has been the demand for their services that it has been found impossible for all requests to be acceded to. Pressure of work in other directions made it imperative that the judging at shows, as previously undertaken, be discontinued.

The demand for settings of eggs and birds for breeding purposes from the Milton Poultry Station has been well maintained. The sales were: Settings of eggs, 1,175; birds, 715. The stock at this farm is of a very high standard both from a breed and a utility viewpoint, but the buildings, fences, &c., (as referred to in my last annual report) are fast going from bad to worse. In short, the plant is out-of-date, and does not constitute an object-lesson to visitors as to what a poultry plant should be. I am firmly of the opinion that it should be either mended or ended at once.

A poultry section at the Avonhead Training-farm of the Repatriation Department was authorized by that Department for the purpose of teaching discharged returned soldiers the business of poultry-keeping. The work of planning the plant, and controlling it, together with the training of the men, is solely in the hands of the Poultry Instructors of the Department of Agriculture. This plant is undoubtedly one of the most, if not the most, up-to-date of the poultry establishments in the Dominion. The number of soldiers desiring training on it is more than can be coped with.

A most notable occurrence during the year was the restriction placed on the importation of egg-pulp, liquid yolks, and desiccated whites. This appears to be a step in the right direction, as it

will give poultry-keepers an incentive to increase their flocks and so increase the Dominion's egg-yield. Asiatic egg-material in particular can be sold at a price which the local producer cannot compete with. It will thus be readily understood that poultrymen did not have sufficient confidence in their business to increase their flocks so long as this cheap egg-material was allowed to be imported in unlimited quantities.

The trial shipment of about 120,000 eggs sent to Canada arrived in good condition, and netted producers 2s. a dozen. By having opposite seasons, and on account of the shortness of the sea trip necessary, it is quite possible that Canada may be able to take any surplus of eggs likely to be produced in New Zealand. It will, however, be time enough to think about an export trade when the local demand is satisfied.

With a more assured and cheaper food-supply—at any rate as far as oats are concerned—and the restrictions placed on the Asiatic egg-pulp, there is a good prospect of the flocks of the Dominion being increased, and the industry regaining its pre-war level of importance. It will probably take another hatching season before cheap eggs may be looked for. As in the past, we must look to the small settler on the land to increase his flocks, and to feed and manage them in a proper manner. The fact of the low market value ruling for many lines of farm-produce will necessarily tend towards more attention being given to the despised hen-run. It will usually be found that the smaller the settler the greater is the number of birds kept *pro rata*, and the better the attention they receive. Thus the greater the growth of small settlement the greater will the industry increase in importance. Poultry-keeping as a side line, whether it be with the small farmer or the suburban resident, is the surest and best means by which the industry can be built up. Poultry-farming as a safe means of making a livelihood is all right in its way, but if permanent success is to be attained the person in charge must have special qualifications, which few individuals possess. It is safe to assume that if all, or even the majority, of the poultry stock in the Dominion was of the correct laying-type, and was fed and managed in a proper manner, the question of importing eggs would probably be unheard of. In view of this, the distribution of high-type laying-stock, and a real live policy of giving instruction in the managing of poultry on sound lines, appears to be the great present-day essential.

Rabbit Nuisance.

The administration of the Rabbit Nuisance Act has been carried on with energy throughout the year, but the weather conditions militated considerably against a reduction of the pest to the extent desired. During the present autumn, however, conditions for poisoning became better, and where this was taken full advantage of the pest has been reduced to an extent almost marvellous. Especially is this noticeable in the rabbit-infested districts of the Auckland Province, where their ravages were threatening to become quite as bad, if not already so, as some of the worst-infested districts of the South. The good work done is being followed up by settlers in the use of carbon bisulphide, with excellent results. As regards the work of destruction in the South Island, I am afraid that such good results as are being obtained in the North cannot be reported to apply here, the opposition to the Department's policy, which has always been more or less prominent in Otago in particular, having added to the difficulties surrounding this problem. I feel certain that had the same spirit existed in the South at the beginning of this campaign as that found in the North the pest in the South Island would have shown the same favourable position which is to be found, as a whole, in the North. I unhesitatingly attribute this better condition to the fact that the settlers, being honestly desirous of seeing the last of the rabbit, if such a consummation be possible, recognized that the Department must have the power bestowed by the 1918 amendment to the Act, and determined to do their utmost to work in with the Department's officers. The result is apparent to any one who is conversant with the past conditions and who sees that country to-day. The Department has continued its policy of supplying, at a price now much below cost, phosphorized pollard and oats; and it also supplies large quantities of strychnine and carbon bisulphide. Supplies of phosphorus are also always available for sale, but the quantity sold is not large, as the manufactured article is preferred. Prosecutions to the number of 163 were found necessary during the year, Auckland and Otago contributing the greater number. In most districts Magistrates have looked upon the offence as a serious one, and inflicted fines accordingly.

I append hereunder the reports made by the District Superintendents on this work in the respective parts of the Dominion controlled by them:—

Dunedin.—It was freely contended by many landowners, rabbit-exporters, and rabbiters that the high prices ruling for rabbits and rabbit-skins last season would have a great effect on the state of the pest during spring and summer. This, however (although abnormally high prices were reached), has not been borne out. As a matter of fact no material improvement appears to have taken place, and the pest is still very numerous over a large area of country. Until united systematic and thorough action is adopted by landowners generally we will continue to be faced with the same unsatisfactory conditions. Unfortunately, many landowners seem quite indifferent to the ravages of the pest, and their greatest trouble seems to be how best to evade the provisions of the Act until some one comes along and offers to do their rabbiting at no initial cost to themselves. At the present time various methods of rabbit-destruction are carried on by individuals, but in few cases are simultaneous steps adopted. Thorough poisoning with phosphorized or strychnine baits—pollard, oats, carrots, turnips, or apples—in the early spring or mid-autumn, followed up by fumigating with smoke or carbon bisulphide and thoroughly blocking burrows, and destroying cover, are the best-known means by which we can expect to effectively control and eventually reduce the pest to a minimum, the carrying-out of the whole operations to be done entirely under close and strict supervision by practical men. Prosecutions for the year totalled 124, and fines ranging from 10s. to £100, with costs, have been imposed. The formation of Rabbit Boards now appears to appeal to a certain class of the farming community, and I believe that quite a number of meetings are being convened in different parts to put the matter in motion; no doubt this is being brought about by the substantial fines imposed in many cases. The Rabbit Nuisance Amendment Act of 1920, increasing the power to levy rates on an acreage basis, is a decided improvement so far as it applies to low-valued lands. The manufacture and sales of phosphorized pollard and oats at Invercargill, Lawrence, and Ranfurly depots is still going on pending the erection of a central depot in Dunedin. The following are the 1920–21

sales of poison, &c., by the Department to storekeepers and settlers: Phosphorized pollard, 179,010 lb.; phosphorized oats, 7,705 lb.; phosphorus, 471 lb.; strychnine, 1,667 oz.; carbon bisulphide, 4,094 lb. The quantities of material used on Crown lands, Native lands, and railway-lines were as follows: Phosphorized pollard, 6,032 lb.; phosphorized oats, 583 lb.; strychnine, 8 oz.; carbon bisulphide, 2,588 lb.; charcoal, 2,310 lb.; chemical, 1,237 lb.; coal for fumigating, 10¼ sacks; cartridges, 550.

Christchurch.—Towards the end of winter (1920) there was a considerable reduction in the number of rabbits practically all over the district. However, to the disappointment of the Inspectors and myself, this was followed by one of the best breeding seasons for rabbits that has ever been known in Canterbury, and consequently by the end of summer they had increased considerably. To make matters worse, wet weather spoiled a considerable portion of the phosphorized-pollard poison laid in January and February, and this work had to be done over again. Notwithstanding these setbacks, I feel safe in stating that there is a reduction of the pest at the end of this year (31st March, 1921) as compared with the same time last year. However, rabbits have not yet been reduced to pre-war numbers in all the Inspectors' districts. More work for the reduction of rabbits has been carried out than has been done in any other recent year, principally on account of labour being more easily procurable. Phosphorized pollard, strychnine-and-carrots, toxa, dogging and shooting, fumigating, digging out, trapping, &c., have all been more or less resorted to as a means of destroying the pest. Phosphorized pollard is the poison principally used, but for some reason or other rabbits occasionally do not take it well; this has been particularly noticed on several of the runs in the Mackenzie country, with the result that time was lost and landowners had to resort, at considerable expense, to other means of destroying rabbits. More strychnine-and-carrots has been used than in previous years, and landowners are now becoming less afraid to make use of this method of poisoning. Toxa has been used with varying results. In some instances it was very successful, while in others the results were very disappointing. Fumigation has been made more use of in this district than in previous years. I am pleased to report that trapping has not been carried out to such an extent as was done the previous year. Settlers appear to be realizing the fact that traps are one of the last means to use in trying to get rid of the pest. They are also evidently realizing that simultaneous poisoning at suitable times and intervals is the best means of destroying rabbits, and the Inspectors have in general been successful in getting occupiers to poison simultaneously. Settlers, I am pleased to note, are also taking a greater interest in the reduction of the pest. This is evidenced by the fact that although rabbits in general have been reduced in the district during the past two years the matter is brought up at some of their meetings, showing that they are alive to the necessity of doing everything possible to destroy the pest. It is to be regretted, however, that a considerable number of settlers, after having had good results from poisoning, have to be prompted by the Inspectors to continue this good work. In some parts of the country the natural enemies of the rabbit are showing up, and it is wonderful the good work they can do. This was particularly noticed in a recent inspection of the back country of Amuri, where numbers of recently killed rabbits were seen, all showing evidence of having been killed by stoats or weasels. It is to be noted also that on this country there has been no trapping. The Inspectors in general have carried out their duties in an energetic and tactful manner. During the year 96,191 lb. of phosphorized pollard, 663 oz. of strychnine, and 378 lb. of phosphorus were sold from the Government depots in this district. The decrease in the output of phosphorized pollard is compensated for by the increased use that has been made of strychnine. Six prosecutions were carried out under the Rabbit Nuisance Act, the defendants being convicted and fined amounts ranging from £2 to £8, plus costs.

Wellington.—The work of rabbit-destruction has been vigorously carried on throughout the year, poisoning being the principal method of extermination advocated and used. The rabbit-infested portions of the district have this year been thoroughly poisoned, tons of pollard-poison being laid in districts where little or no work had been done for many years. The Moawhanga country in the Taihape inspection district is a case in point. Over 20 tons of poison from Departmental poison-depots, in addition to a quantity of locally made poison, has been laid on the lands in this locality, including the Kaimanawa Ranges. These lands had had little or no poisoning for the last ten years. In the Feilding and Marton districts, which have never been previously treated, large areas of country have this year been poisoned. It was unfortunate that the supply of poison ran short during the good poisoning months of the autumn, but this was unavoidable, and is not likely to occur again. I am glad to report that very little trapping has been done this season, as where poisoning and fumigating are the means of extermination adopted, and trapping left severely alone, a much better control of the pest is obtained and maintained. A substantial reduction in the pest has been made, and I hope this will not only be maintained but that a further reduction will be again shown next year.

Auckland.—Following a very favourable breeding season for rabbits, the climatic conditions during the autumn and winter of 1919–20 proved most unfavourable for poisoning, which made the fight against the pest during those seasons very arduous work indeed. The past spring and summer have again provided ideal conditions for the propagation of the pest, and the increase has been very heavy. Notwithstanding these unfavourable conditions with which both the Department's officers and settlers have had to contend during the past two years, steady and appreciable progress has been made against the pest in almost all parts of the province, in some localities being especially gratifying. The climatic conditions during the present autumn have been very favourable for poisoning, and excellent results have been obtained with phosphorized pollard since the general poisoning commenced in February. Unfortunately, however, the work has been very considerably retarded on account of the Frankton poison-depot being unable to cope with the demand for poison. This failure has prevented the simultaneous work by settlers in the different districts which is so essential to success, while in a number of localities it has been responsible for delaying the work altogether till the weather broke and the most favourable opportunity of the past two years had passed. Very gratifying results have attended the use of carbon bisulphide for fumigating burrows, and we have been strongly advocating this method of destruction during the past eighteen months. Settlers have now come to realize the value of this agent, with the result that a demand has set in for bisulphide with which we have so far been quite unable to cope. We have 9 tons on order, and no difficulty will be experienced in disposing of this quantity when it comes to hand. Organization among settlers for the purpose of fighting the rabbit pest has continued to improve, and the various Rabbit-destruction Committees and Rabbit Boards have been of great assistance to the departmental officers. Three legally constituted Rabbit Boards are now in operation and working satisfactorily—one at Peria, in the Matamata district; one at Maungakawa, in the Cambridge district; and one at Hairini, in the Te Awamutu district. The success which has attended the operations of the Hairini Board has been very pronounced. Following are the quantities of phosphorized pollard despatched from the Frankton depot (for use in the Auckland Province) during the periods of twelve months ending 31st March: 1918, 64,880 lb.; 1919, 124,559 lb.; 1920, 150,043 lb.; 1921, 133,800 lb. To the 1921 figures might be added 16,048 lb. of poison which had been ordered but not despatched on the 31st March. The total output from the depot for the three months, January to March, was 90,724 lb. There was also a further 28,048 lb. on order awaiting despatch. During the year this depot also sent out carbon bisulphide, 13,482 lb.; phosphorized oats, 1,234 lb.; and strychnine, 216 oz.

Noxious Weeds.

During the year some very good work has been done in the cutting and clearing of noxious weeds, particularly blackberry, regarding which a tightening-up in the administration of the Act, especially in districts where this weed had not got beyond control, has had a good effect. Californian thistle presents the greatest problem, and to meet the position as regards this weed, and also to provide the other measures required to make the Act at least to some extent more workable, an Amendment Bill was brought down last session of Parliament. This, however, failed to reach the Committee stage before the rising of Parliament, but will, I trust, be brought forward early in the coming session.

The scarcity of labour generally during the period under review and the high wages demanded did not encourage occupiers to carry out the necessary work, and under the present financial conditions the administration of the Act in the direction of getting weeds cut, or even in maintaining the position obtained, will be difficult.

Staff.

To the members of the staff I desire to convey my thanks for the assistance they have rendered in the carrying-out of the numerous duties asked of them. Good work has been done by the District Superintendents and Principal District Inspectors at Dunedin, Christchurch, Wellington, and Auckland, and by the officers of all grades acting under them; while Mr. F. C. Brown, Chief Poultry Instructor, Messrs. Cussen, Jarrett, and Cocker, Poultry Instructors, and Messrs. Cook, Wool Instructor, and Gorringe, Instructor in Swine Husbandry, have all been extremely busy answering the calls made for their services. The appointment of the two last-named officers has been more than justified by results, their services having been largely availed of for the purpose of lecturing and for practical advice. In the case of the Wool Instructor, practical demonstrations have been given in central shearing-sheds on the preparation of wool for the market, and instructional classes have also been held for returned soldiers.

DAIRY DIVISION.

REPORT OF THE DIVISIONAL DIRECTOR.

The Director-General. Wellington, 12th May, 1921.

I herewith transmit a report of the work of the Dairy Division for the year ended 31st March, 1921. Mr. D. Cuddie continued his work as Director until 18th June, 1920. Since that date I have been acting as Director, and desire to acknowledge the hearty co-operation of the officers of the Division in carrying on during the Director's absence.

W. M. Singleton, Acting-Director.

The Season.

Throughout most of the dairying districts the year under review must be regarded on the whole as one of the most favourable experienced for some time. A mild summer in 1920 was responsible for a larger yield per cow for that period than is usually the case. In the Southland District this was followed by a mild winter, but in the North Island a succession of heavy frosts greatly retarded the growth of grass. This was unfavourable to dairy cows, and where supplementary feeds were scarce cows lost in condition to such an extent that many commenced the milking season when they were much too low in flesh to do themselves justice as producers. The spring months were not propitious. Grass grew but slowly, owing to cold inclement weather. The advent of summer, however, brought forth a great flush of grass. Dairy cows produced remarkably well; grass suitable for hay was in abundance; and during beautiful haymaking weather this was converted in large quantities into splendid fodder. The extra quantity and better quality of the hay so saved should augur well for improved conditions on dairy farms during the coming winter. The last two months of the period under review proved, in a number of districts, a period of anxiety for dairymen. Wellington Province has been dry, and Taranaki suffered considerably from lack of rain; North Auckland has been favoured more than other districts, and reports a splendid summer and autumn. For the Dominion generally, however, the dairying season must be regarded as good.

Diversion from Cheese to Butter Manufacture.

During the autumn of 1920 the directors of a number of dairy companies, then making cheese, were of the opinion that throughout the current season it might be more profitable to manufacture butter. It was known that the world's production of butter was below pre-war quantities, and that the production of cheese had been favoured by comparative prices during the war period. In anticipation of making a change from cheese to butter, many dairy companies with buildings suitable for manufacturing either butter or cheese deemed it advisable to make such additions to their butter plant last winter as would enable a quick change-over to the manufacture of butter. During the spring the buoyancy of the cheese-market caused such dairy companies to continue making cheese. Later on, however, the advances on cheese to be consigned to the British market were reconsidered, and in some instances reduced. Inasmuch as companies manufacturing butter could obtain an advance of 90 per cent. of the value after fourteen days' storage, and the remaining 10 per cent. when the butter was f.o.b., and seeing also that the shipping of butter was experiencing less delay, many dairy companies decided to divert from cheese to butter manufacture. In December, January, and February, therefore, our dairy industry evidenced the most extensive change from the manufacture of one product to another that it has yet experienced. The majority of the large dairy companies in Taranaki changed their manufacture to butter either in whole or in part. The movement was also in force to a greater or lesser extent in the other dairying districts.

Production and Exports.

The figures indicating the quantities of butter and cheese graded credit butter with an increase of 92 per cent., and cheese with an increase of 1 per cent over those of the previous year. The figures representing the exports do not altogether harmonize with these. The increase in butter and the decrease in cheese as shown by the export figures have each been to some extent affected by the overlapping of seasons so far as shipments are concerned. The grading figures are therefore a more satisfactory criterion for appraising the general position, although in the case of butter even these have to some extent appreciated, owing to the previous season's butter being used for local consumption last spring to a greater degree than usual. Not since 1917 had our butter-production shown an increase. For many years the comparative prices had been in favour of cheese; thus development was principally in that direction. As will be shown hereafter, circumstances this season were in favour of the production of butter, and the accompanying figures indicate how successful has been the effort of the Dominion's dairy-farmers toward increasing production.

Export Statistics.

The following tables indicate the exports of butter and cheese, in accordance with the various classes, grades, and destinations, for the year ended 31st March, 1921. The quantities graded appear in the last table. For purposes of computation, a box of butter has been taken as weighing 56 lb. and a crate of cheese as weighing 160 lb.

Creamery Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	514,656	472,719	41,885	52
Gisborne	9,903	9,903	..	..
New Plymouth	112,988	112,187	801	..
Patea	32,481	26,510	5,971	..
Wanganui	35,826	25,405	10,421	..
Wellington	177,587	172,668	4,919	..
Lyttelton	62,083	59,277	2,806	..
Dunedin	36,505	32,041	4,464	..
Bluff..	6,524	6,524	..	..
Totals	988,553	917,234	71,267	52

Whey Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	9,207	122	9,085	..
New Plymouth	9,431	6,896	2,535	..
Patea	12,278	9,681	2,597	..
Wanganui	1,567	108	1,459	..
Wellington	11,673	10,161	1,512	..
Lyttelton	578	393	185	..
Dunedin	1,976	1,860	116	..
Bluff..	676	671	5	..
Totals	47,386	29,892	17,494	..

Dairy Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
New Plymouth	135	50	85	..
Patea	9	9	..	..
Totals	144	59	85	..

Milled Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	550	229	321	..
New Plymouth	48	6	42	..
Wanganui	62	24	38	..
Wellington	6,414	5,640	774	..
Totals	7,074	5,899	1,175	..

Butter to United States of America, Egypt, and Singapore.

Port.	Destination.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland ..	America	61,090	61,090	..	..
	Egypt	800	800	..	..
	Singapore ..	2,000	2,000	..	..
Totals ..	..	63,890	63,890	..	..

Butter to Australia and South Sea Islands.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	3,099	3,099	..	..
Wellington	1,000	1,000	..	..
Totals	4,099	4,099	..	..

Total Quantity of Butter exported.

Port.	Creamery.	Whey.	Dairy.	Milled.	Totals.	Weight.
	Packages.	Packages.	Packages.	Packages.	Packages.	Cwt.
Auckland	581,645	9,207	..	550	591,402	295,701
Gisborne	9,903	..	..	..	9,903	4,951
New Plymouth	112,988	9,431	135	48	122,602	61,301
Patea	32,481	12,278	9	..	44,768	22,384
Wanganui	35,826	1,567	..	62	37,455	18,728
Wellington	178,587	11,673	..	6,414	196,674	98,337
Lyttelton	62,083	578	..	..	62,661	31,330
Dunedin	36,505	1,976	..	..	38,481	19,241
Bluff	6,524	676	..	..	7,200	3,600
Totals	1,056,542	47,386	144	7,074	1,111,146	555,573

Cheese to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	196,396	177,111	19,285	..
New Plymouth	136,461	132,531	3,930	..
Patea	184,784	175,917	8,596	271
Wanganui	9,948	9,584	364	..
Wellington	193,437	167,343	25,860	234
Lyttelton	28,712	27,810	902	..
Dunedin	32,445	31,640	805	..
Bluff	78,935	77,339	1,596	..
Totals	861,118	799,275	61,338	505

Cheese to Australia and South Sea Islands.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	487	470	17	..
Totals	487	470	17	..

Total Quantity of Cheese exported.

	Packages.	Cwt.
Auckland	196,883	281,261
Gisborne	..	..
New Plymouth	136,461	194,953
Patea	184,784	263,977
Wanganui	9,948	14,211
Wellington	193,437	276,339
Lyttelton	28,712	41,017
Dunedin	32,445	46,350
Bluff	78,935	112,764
Totals	861,605	1,030,872

Quantities of Butter exported for the Years ended March, 1920 and 1921.

Port.	1920–21.	1919–20.	Decrease, 1920–21.	Increase, 1920–21.	Net Total Increase, 1920–21.
	Packages.	Packages.	Packages.	Packages.	Packages.
Auckland	591,402	337,734	..	253,668	..
Gisborne	9,903	4,720	..	5,183	..
New Plymouth	122,602	47,058	..	75,544	..
Patea	44,768	8,720	..	36,048	..
Wanganui	37,455	15,542	..	21,913	..
Wellington	196,674	66,194	..	130,480	..
Lyttelton	62,661	34,239	..	28,422	..
Dunedin	38,481	9,694	..	28,787	..
Bluff	7,200	..	..	7,200	..
Totals	1,111,146	523,901	..	587,245	587,245

Quantities of Cheese exported for the Years ended March, 1920 and 1921.

Port.	1920–21.	1919–20.	Decrease, 1920–21.	Increase, 1920–21.	Net Total Decrease, 1920–21.
	Packages.	Packages.	Packages.	Packages.	Packages.
Auckland	196,883	150,281	..	46,602	..
New Plymouth	136,461	206,483	70,022	..	..
Patea	184,784	243,626	58,842	..	..
Wanganui	9,948	16,726	6,778	..	..
Wellington	193,437	251,507	58,070	..	..
Lyttelton	28,712	27,747	..	965	..
Dunedin	32,445	37,873	5,428	..	..
Bluff	78,935	96,839	17,904	..	..
Totals	861,605	1,031,082	217,044	47,567	169,477

Quantities of Butter and Cheese forwarded to Grading-stores for Grading

Port.	Year 1920–21.		Year 1919–20.	
	Butter.	Cheese.	Butter.	Cheese.
	Cwt.	Cwt.	Cwt.	Cwt.
Auckland	360,686	256,227	210,611	211,321
Gisborne	5,868	..	8,325	..
New Plymouth	71,038	201,394	38,278	222,798
Patea	36,830	223,783	5,898	280,940
Wanganui	18,633	15,880	9,825	17,840
Wellington	110,995	309,098	48,576	284,906
Lyttelton and Timaru	40,634	40,884	17,942	31,236
Dunedin	20,362	49,656	8,976	51,120
Bluff	7,012	133,376	..	115,824
Totals	672,058	1,230,298	348,431	1,215,985

The Butter Industry.

The phenomenal increase in the production of butter during the season has been the result of a number of operating factors. The number of dairy cows in New Zealand has for years been steadily increasing; the number of dairy-farmers has also been augmented, this being due, in part, to many returned soldiers selecting dairying as a vocation. It was considered last spring by those in authority in England that there would be a shortage of butter on the Home markets. To encourage production the price paid for our butter by the Imperial Government for the season under review was increased by some 99s. per hundredweight over that of the preceding season. The effect was as planned, and from 1st August to 31st March the quantity graded showed an increase of some 88 per cent.

Despite some decline in the price of butter on the British market, it is anticipated that next season's production of milk for manufacturing dairy-products will evidence an increase. The comparatively low prices obtaining for wool and meat are inducing a number who have not hitherto been dairying to make arrangements in this direction. Prices which will be offered for next season's produce are as yet uncertain, and are likely to be influenced by many factors. Russia, which in pre-war days supplied some 40,000 tons of butter to Britain annually, is still off the market. The quantity of butter imported by Britain during 1920 was only about 41½ per cent of the pre-war figures. These factors tend to inspire confidence in the future, but are somewhat offset by the fact that during the war period margarine replaced the shortage of butter and provided a considerable surplus besides. The rate of exchange between the United States of America and other countries has induced a considerable export of butter to the United States from Denmark and the Netherlands, as well as from Argentine and Canada. In 1914 the United States tariff on butter was reduced from 6 cents per pound to 2½ cents. This has continued until this year, but cable advices indicate a movement towards having the 6-cent duty reinstated or increased. It is expected that the effect of such an increase would be to overcome the incentive to export butter to the United States caused by the unequal exchange rates. If this eventuates, such butter as was formerly imported into the United States may in future go to Britain for a market.

The interruptions to the manufacturing industries so frequently occurring in Britain during her attempt to get back to normal conditions are, after all, the most potent influence likely to affect prices for dairy-produce next spring. If industry settles down so that the purchasing-power of the people attains a satisfactory condition, it is hoped our dairying industry may avoid the difficulties now being experienced by the meat and wool industries.

Quality of Creamery Butter.

The flavour of creamery butter has in some of the important dairying districts improved remarkably. The most marked improvement has taken place in a portion of the district served by our largest co-operative dairy company. This company has instituted cream-grading, and linked to this dairy-farm instruction. The first service finds and indicates the faults in the cream supplied, while the second provides the dairy-farmer with advice as to the best method of overcoming such defects. In the majority of districts the quality has been well maintained, and this despite the many difficulties connected with manufacture during these abnormal times. Much credit is due to many factory-managers on having attained such satisfactory results.

In some instances the quality was not good. Some factories received home-separated cream from suppliers who had not previously sent their cream to a butter-factory, and some of this cream possessed a flavour much below the average. A number of the dairy factories which diverted during the season from cheese to butter did not get into proper running-order for a little time, and this feature accounted for some of the lower-scoring butters. Later on a much better butter was received from these factories, and in general the diversion was attended with less low-scoring quality than was anticipated.

Whey, Milled, and Dairy Butter.

Some of the whey butter manufactured has been of a quality that reflects credit on the manufacturer. A number of brands coming forward for grading bear testimony to good workmanship and careful attention. At too many factories, however, the whey butter is regarded only as a subsidiary issue and receives little consideration. There has been a steady increase in the quantity manufactured, and all dairy companies should now expect their managers to give this department of the work the attention it deserves. Given such attention it has been amply demonstrated that a good merchantable article can be produced.

The quantity of milled butter evidences an abnormal increase. Last July and August those using butter for manufacturing purposes stored considerable quantities of creamery butter in anticipation of a rise in price. This action obviated the necessity of drawing on the summer market for the usual quantities of dairy and milled butters, consequently more of the latter was available for export. The Butter Prices Equalization Fund payments were not paid on dairy butter used for local consumption. This consideration induced many to use creamery butter on their tables instead of dairy, and greater quantities of dairy butter were therefore milled and sold for export. The increase in our exports of this class of butter has been due, therefore, to adventitious circumstances, and the volume is unlikely to be maintained when conditions revert to normal. The decrease in the gradings of dairy butter is doubtless explained by the increase in milled butter.

Moisture in Butter.

During recent years the cost of producing butterfat has practically doubled, and in addition there has been the ever-increasing cost of manufacturing butterfat into butter. It is a duty a manager owes his dairy company to see that he makes as much butter per pound of butterfat as practicable. To do so he must ensure that his butter contains as near the legal limit for water as prudence will permit. Many managers are doing their best to follow this principle. Owing, however, to faulty testing-appliances, to lack of proper care in testing, or to taking unjustified risks with high-water-content butter, a number of instances have been discovered where butters offered for export have shown a water content beyond the legal limit. Where the excess of moisture has been small and has constituted the company's first offence, such butters have been returned to the factory. Other butters have been reconditioned and the water content reduced at the company's expense. Owing to lack of care on the part of some managers being rather too much in evidence it appears probable that before long it may be considered advisable to recommend legal proceedings.

Distribution of Butter for Local Consumption.

During the months June to September inclusive the quantity of butter held by dairy companies and others, outside the Imperial Government Supplies Department, was insufficient to meet requirements for local consumption. Arrangements were made by the Department of Agriculture for the purchase from the Imperial Government of the quantities necessary to supplement the available "free" butter for New Zealand's winter requirements. An Order in Council of 17th June fixed maximum sale prices for butter made up to the end of July at 1s. 5¾d. ex store, and 1s. 9d. retail. In order that the Government butter might be placed on the market as necessary, this Division was called upon to effect sales to the usual distributors as stocks were required. These transactions represented over 69,000 boxes of butter, and enabled consumers to get what quantities were needed until the spring make had sufficiently developed to ensure ample supplies. With the advent of the current season's make on the local market new prices were fixed. This was done per medium of an Order in Council dated 18th October, 1920, fixing local prices for the current season's make at 2s. 3d. cash over the counter, and 2s. 5d. booked and delivered. These prices were in force until the end of the financial year, when the contract between the Imperial Government and the dairy factories was completed.

Butter Prices Inquiry Committee.

The contract arranged last spring for the disposal to the Imperial Government at 280s. per hundredweight, or 2s. 6d. per pound f.o.b., of our surplus butter to the end of March, made necessary an adjustment of the local retail price. It was the opinion of many urban consumers that the cost of production did not warrant the local consumers paying a price on a parity with the value for export.

A Select Committee of the House of Representatives, known as the Butter Prices Inquiry Committee, was set up to take evidence and report on the matter. A considerable number of witnesses representing producers and consumers were interviewed. A representative of this Division attended each sitting of the Committee. From the point of view of indicating cost of production, evidence was tendered by a number of dairymen from various districts of the Dominion. Balance-sheets representing dairy-farm operations were produced, and these disclosed the fact that dairy-farmers were not receiving more than they might be reasonably entitled to expect. The Committee was "of the opinion that the dairy-farmers are entitled to the full benefit of the market price for butter."

The Butter Prices Equalization payments were then arranged, so that the dairy-farmer could get the market price for such butter as went into local consumption. To effect this and at the same time fix a retail price of 2s. 3d. cash over the counter, the consumer was assisted to the extent of 6d. per pound from an equalization fund established by the Government.

The Cheese Industry.

Quality of Cheese.

The cheese which this Dominion has been exporting during recent years has been favourably commented upon in London, and it is considered that improvement has been made. Two factors contributing in this direction are doubtless (1) pasteurization of milk for cheesemaking, and (2) the longer maturing of the cheese, both on the curing-room shelves and in the cool store while awaiting shipment. The working arrangements between the cheese companies and the Imperial Government stipulated that such cheese as was sold for filling these contracts should lie for fourteen days on the shelves before being cased. This requirement was considered so beneficial that steps were taken to have it continued. An Order in Council dated 21st October, 1920, makes provision in that direction, and the cheese companies have endeavoured to give effect to this requirement, although in a few instances lack of curing-room space made such an effort extremely difficult. It is generally recognized, however, that the regulation affords more protection to the industry generally, and was therefore desirable.

The quality of our cheese has been well maintained during the past season. Some districts, however, have shown little, if any, improvement in the better brands, but have shown a reduced percentage of second grade. Supplies of milk increased so much at a number of cheese-factories that a night shift was required. This necessity, with its attendant disabilities, was not found conducive to the manufacture of produce of such good quality as would have been the case under normal conditions. Dry-weather conditions during the late summer and autumn are considered to have altered the relation between the milk constituents to a degree which in some districts necessitated a more or less marked variation in manufacture. Before the need for the change was recognized, some cheese was manufactured which was not quite equal to the usual standard. In other districts, however, the managers have improved the body and texture of some brands, and openness and cracked rinds have been somewhat less in evidence.

Pasteurizing Milk for Cheesemaking.

Probably in no other country in the world has the pasteurization of milk for cheesemaking been adopted to an extent equal to that in this Dominion. During this season twenty-one cheese-factories installed pasteurizing-machines, while of the Dominion total of 389 cheese-factories 172 were using pasteurizers. The output of these factories represented 36,576 tons of our total production of 61,514 tons. Taken generally, the effect of pasteurization has been decidedly advantageous, as it has been our experience that cheese made from such milk cures more uniformly, and retains a cleaner flavour during the maturing process. There are, however, managers, directors, and suppliers who act as though the pasteurizer will overcome all defects in the milk-supply. Disappointments in this direction have been all too frequent and costly to a number of dairy companies.

Cool Storage of Cheese.

The congestion of cheese at New Zealand ports during the period of the war was responsible for an extension of cool-storage facilities at each and every cheese-grading port. Save at Auckland for a short period this autumn, the accommodation has been sufficient for this season's requirements. Just recently ordinary storage has been resorted to at that centre, but, as the hot summer weather has been followed by much cooler climatic conditions, no deleterious effects from such ordinary storage are anticipated.

During the season cheese in store at Dunedin has received excellent treatment. Mechanical refrigeration has been installed, and the cooling, in addition to a good circulation of air, has enabled the cheese to be held in better condition than hitherto.

No improvement has been effected in the conditions under which cheese from Patea, and sometimes New Plymouth, is held while awaiting loading into the export steamer in Wellington. The Wellington stores could not afford space for such transhipment cheese, as the cheese from the Wellington District taxed their capacity to the utmost.

Grading of Dairy-produce.

The grading of butter, cheese, and casein has been carried on without change in the personnel of this portion of the staff. As a result of the development of the industry a very considerable increase in this work has been occasioned during the season. The grading has been conducted on the usual lines, and leaves little room for comment.

Since 1916, owing to shortage of refrigerated shipping-space, it was found necessary to grade cheese at a few private cool stores erected by certain dairy companies. Owing to the fact that during the current season more space was available at gazetted grading-stores, a continuance of this practice became unnecessary and was therefore discontinued.

Throughout the season some nine grading conferences were held under the auspices of the New Zealand Factory-managers' Association. Practically without exception these were well attended by dairy-company directors and factory-managers. Five of these meetings were held at grading-ports, where the actual work of grading was viewed by the factory representatives. Three of the conferences were held at dairy factories in the Dannevirke, Kairanga, and Pahiatua districts respectively. For these conferences samples of cheese were collected from surrounding factories, and after these had been graded by officers of this Division, matters pertaining to cheese-quality and the industry generally were discussed. It is considered that such conferences tend to produce uniformity in the product, and raise the general standard of quality. This activity of the New Zealand Factory-managers' Association is certainly praiseworthy.

Table showing the Grading-points scored by the Creamery Butter and Cheese graded throughout New Zealand for the Year ended 31st March, 1921.

Grading-points.	Butter.		Cheese.	
	Number of Boxes.	Percentage of Total.	Number of Crates.	Percentage of Total.
76½	..	..	435	0·0505
78	339	0·0264	..	..
78½	..	..	433	0·0502
79	304	0·0237	20	0·0023
80½	43	0·0033	..	..
81	15	0·0011	148	0·0171
81½	701	0·0547	..	..
82	266	0·0207	1,112	0·1291
82½	246	0·0192	1,568	0·1820
83	1,146	0·0894	1,013	0·1176
83½	895	0·0698	2,251	0·2613
84	5,037	0·3933	6,035	0·7007
84½	3,634	0·2837	4,553	0·5286
85	12,812	1·0004	9,704	1·1268
85½	17,266	1·3483	10,253	1·1905
86	28,104	2·1946	19,284	2·2392
86½	20,415	1·5942	8,766	1·0177
87	465	0·0363	71	0·0082
88	19,070	1·4891	33,826	3·9277
88½	31,459	2·4566	42,169	4·8965
89	56,167	4·3861	81,847	9·5038
89½	54,479	4·2542	99,555	11·5600
90	67,660	5·2836	125,088	14·5249
90½	99,405	7·7625	116,632	13·5430
91	122,665	9·5789	102,872	11·9452
91½	147,087	11·4861	76,851	8·9237
92	183,992	14·3680	62,183	7·2205
92½	162,399	12·6818	27,113	3·1482
93	106,601	8·3245	17,798	2·0666
93½	65,564	5·1199	7,007	0·8136
94	39,865	3·1130	2,368	0·2749
94½	18,359	1·4336	100	0·0116
95	10,815	0·8445	140	0 0162
95½	2,471	0·1929	..	..
96	819	0·0639	..	..

Charge for Grading Butter and Cheese.

A charge for services rendered by this Division in the grading of butter and cheese has been under consideration on various occasions. In the earlier days of the industry the work of grading was undertaken as a national duty for the purpose of improving the quality of butter and cheese manufactured for export. The developments since then bear testimony to the wisdom of the plan and methods adopted. Keener competition evidenced in the disposal of butter and cheese for export caused buyers to give more attention to quality. The grade-note was accepted in lieu of a buyer's examination, and this has grown into a custom which saves buyers considerable expense as compared with present practice in North America and elsewhere. The grade-note has therefore practically become a commercial document.

The costs relating to the grading of dairy-produce and the instruction at dairy factories have been increasing during recent years owing to the growth of the industry and the payment of higher salaries. It was therefore deemed necessary to institute as from the 1st January, 1921, a charge for the services rendered, and a fee of 1d. per box of butter and 1½d. per crate of cheese was authorized. It is only fair to state that no complaint has yet been heard from any dairy company against such fee being charged.

Casein.

The increase in the production of butter was accompanied as a consequence by an increase in skim-milk. There was a greater inclination to convert the latter into casein, and the output of this product showed a very considerable increase, the export at 1,760 tons denoting an increase of some 75 per cent.

Both lactic and rennet casein were manufactured, a large proportion of the latter being produced toward the end of the season. This variety improved somewhat in quality this season, but it is considered there is still a good deal of room for improvement before the New Zealand article attains to the degree of excellence maintained by French rennet casein, which supplies the highest class at

a price higher than will be paid for our average quality. New Zealand rennet casein is considered to contain too much butterfat. This may be minimized by cleaner skimming. It has been shown this season that some separators were not doing their work with the desired efficiency, which means not only lower-quality casein but also a loss to the buttermaking department as well.

It is considered that New Zealand has many advantages relative to casein-production as compared with competitors, and that, as the use of casein is likely to extend, the further development of the industry is a reasonable expectation.

Milk-powder.

In addition to the factories for the drying of whole milk operated by Messrs. Joseph Nathan and Co., at Bunnythorpe, Matangi, Matamata, and Te Aroha West, there has been running during this season the factory at Waharoa, owned by the Zealandia Milk Products Company, and operated for the purpose of drying skim-milk. Some of this powder has been disposed of on the local market, but the major portion has been shipped to London and has been favourably commented upon. This company expects to commence the drying of skim-milk at its new factory at Waitoa early next season, and to have another factory ready for similar work at Te Awamutu later on in the same season. The Cambridge Dairy Company has erected at Hautapu a new factory for making skim-milk powder; this is also expected to be running early next spring.

Consideration has been given by a number of dairy companies to the drying of buttermilk into powder form. Some plant is on order, and it is hoped that the enterprise will prove satisfactory and successful. The comparatively low prices for calves and pigs which have been current during the latter portion of the year will, if continued, be instrumental in causing dairy-farmers to look for some other outlet for skim-milk and buttermilk. If the world's markets take these powdered-milk products at remunerative prices their manufacture will doubtless receive support.

Milk and Cream Supply.

A considerable improvement has been evidenced in the milk and cream supplied to dairy-factories belonging to companies which have instituted the principle of grading the cream and paying differential prices according to grade, and which have co-operated with this Division in the employment of Farm-Dairy Instructors to assist the dairymen in overcoming defects. Encouraging improvement, although in a less degree, has also been found at factories where cream is graded and differential payments are made, although the company may not have an Instructor. At factories which cannot be included in either of the above classes little if any improvement has been noted.

Competition for milk and cream is keen in some localities. A proper system of grading cream or a careful inspection of milk on the receiving-stage does not suit the competing companies. The demoralizing effect of such injudicious competition, even if such is practised by only one company located in a good centre, is felt by other companies of the district, and militates against any immediate prospect of improvement. Indeed, it is frequently difficult for such adjoining companies to maintain their standard of quality without running the risk of losing supply.

Farm-dairy Instruction.

The importance of a clean, sound, raw material for the production of milk-products has long been recognized. It is, however, only after some farm-dairy instruction has been accomplished that the necessity for such work is adequately appreciated. Butter and Cheese Instructors have hitherto undertaken a little of this work. In most instances, however, only those suppliers delivering the most inferior cream and milk have been visited. In practically all such cases the cause of the trouble has been found in insanitary milking-machines. It is recognized that these machines afford a great saving in labour, but a large percentage of users fail to give them sufficient attention.

There are now some nineteen Farm-Dairy Instructors appointed by the Department, and these are employed in conjunction with dairy companies which contribute toward their salaries. Such officers on commencing duty found from 75 per cent. to 90 per cent. of the machines in their respective districts in an insanitary condition. As instruction proceeded, these Instructors later on in the season were able to report improvement, which has also been maintained in districts where they have been working longer than the one season. The grading of the cream on the receiving-stage, together with a lower payment per pound of fat for lower grades, tends to make dairy-farmers desirous of improvement. A visit by the Instructor to a farm supplying low-quality cream assists the dairy-farmer to overcome his difficulty.

The farm separator is usually found in a cleaner condition than is the milking-machine. It is suggested that dairy-farmers recognize fairly fully that their supply of butterfat is likely to be reduced if separators are not kept in proper order. Too often, however, the separator is installed in the same room as the engine and vacuum-pump. A separate room is a necessity. It has also been found that too frequently separators are disposed of as unsatisfactory when a few shillings spent on repairs is all that is required. The advice of our officers has effected a considerable saving to dairy-farmers in this respect.

Farm-Dairy Instructors are provided with plans of suitable cow-sheds. These plans are much sought after, and have been of much assistance to many dairy-farmers, while the advice of the Farm-Dairy Instructor regarding alterations to sheds has also been of value in this connection. Doubtless, more new sheds would have been built and more improvement effected had cement been procurable in adequate quantities. A number of old-type sheds have been altered to suit machine milking. When a dairy-farmer contemplates making such a change it is advisable that he should consult the Farm-Dairy Instructor of the district, if there be such. The services of such officers should tend ir

future towards the more satisfactory installation of milking-machines. It has been found that shorter lengths of piping should in many cases be used; that connections should for preference be of rubber; and that instead of bends, four-way pieces with plugs tend to easier cleaning.

With every milking-machine installation satisfactory provision should be made for boiling water. Where such provision is made the milk is usually of a better flavour and the rubbers of the machine remain useful for a longer period, inasmuch as they are less likely to become impregnated with fat from the milk. Some dairy companies are now stocking suitable brushware for use in cleaning milking-machines. This practice is to be commended.

A very considerable extension of the farm-dairy instruction-work is urgently needed in the interests of the quality of our butter and cheese. With free market conditions and prices more likely to be falling than otherwise, good quality is of renewed importance. We believe dairy companies can make few investments that are likely to be more profitable than money paid towards the services of a Farm-Dairy Instructor.

Milk and Cream Testing.

The payment for practically all milk and cream delivered to dairy factories in New Zealand is determined by the butterfat test made by the Babcock method. With such a number of tests as this work requires annually it cannot reasonably be expected that all tests will give satisfaction. It is considered, however, that factory-managers are becoming more efficient and careful with this class of work, and that less complaints are forthcoming.

A considerable amount of check testing has been done in our Wellington laboratory. Samples sent forward for check testing must be taken conjointly by an officer of the dairy company and the supplier. Usually such tests have corroborated the factory testing, and our work has been the means of allaying suspicion and engendering more harmony between the factory-manager and his company's suppliers.

Three officers of the Division have been engaged to take control of the composite testing for the dairy companies with whom they are associated. This work has evidently given satisfaction, and further requests for such service have been received. On various occasions officers of the Division have been called upon to make the tests of a period's composite samples at dairy factories, and this work has also proved helpful. In a few instances, outside of the usual work of co-operative companies, and where a proprietary interest was involved, a testing officer was appointed and paid by the suppliers to watch their interests in connection with the sampling and testing. This method removed a great deal of the discontent previously in evidence.

It is considered that the time is now ripe for introducing regulations making compulsory the taking of samples of cream for testing by weight instead of measurement, the use of tested glassware, and possibly other safeguards from the producers' standpoint.

Testing of Purebred Dairy Cows.

The certificate-of-record testing of purebred dairy cows has been continued on the usual lines. Economists have been stressing the necessity for greater production, and this line of testing, commenced by this Division in 1912, contributes directly towards that end. One of the principal factors tending to increase the production of butterfat is doubtless the breeding of cows which will, as the result of qualities received from their ancestors, convert into milk the largest proportion possible of the food eaten, while still maintaining good health and working-condition. Breeders of purebred dairy stock have latterly been supplying bulls to dairy herds in greater numbers, and the production records which the divisional officers have authenticated provide useful information to dairymen when making such selections.

Breeders and dairymen are prepared to pay higher prices for the progeny of cows with an authenticated good record of yield, and consequent upon the recognition of this fact there has been an increase in the number of testing breeders. During the year 280 breeders have been testing, this number representing an increase of 78, or 39 per cent. over last year's figures. The number of purebred cows on test, at 940, represents an increase of 185, or 25 per cent.

To cope with the extra work some five additional testing officers were appointed. The programmes of all testing officers were well filled. Late in the spring and summer a few applications had to be declined owing to the fact that they were from breeders so scattered that the appointment of a further testing officer would not have satisfactorily overtaken the work.

Testing officers have during the year been instrumental in inducing quite a number of dairymen to replace crossbred sires with purebreds. The co-operation of the various breeders' associations in this educational work has been very helpful. There is a splendid opportunity for a very considerable development of this line of endeavour.

Association Testing of Dairy Herds.

The testing of the yield of dairy cows on the association principle has developed extensively during the period covered by this report. The demand for requisites for testing purposes last spring was much in excess of the supply, and although we have the pleasure of reporting a very considerable increase in the number of cows tested we have to recognize that many more would have been tested could arrangements have been made for so doing.

Officers who are testing purebred dairy cows have been called upon to do more association testing, while the appointment of further testing officers last spring enabled us to cope with some of the extra work. Whereas during the previous year officers of the Division tested cows in some twenty-seven associations, this year they tested for some forty associations, an increase of 48 per

cent. The herds tested totalled 713, or 291 more than the preceding season, an increase of 69 per cent. The number of cows tested by divisional officers on the association method numbers 19,799, as compared with 10,460 for the previous year, thus showing an increase of 9,339, or 89 per cent. In addition to the number of cows which have been tested and had their records computed by officers of this Division, some 15,958 have been tested for a whole or a part of the season by the dairy companies to whom the herd-owners were supplying milk or cream.

Staff.

Much regret is felt by the officers of the Division concerning the Director's continued ill-health. One and all wish Mr. Cuddie a speedy recovery.

The staff of the Dairy Division now includes twenty-four Dairy Instructors and Graders (butter, cheese, and casein), nineteen Farm-Dairy Instructors, twenty-three Milk-testers, and eighteen officers connected with the clerical work. During a particularly busy season all have performed their duties efficiently and well.

HORTICULTURE DIVISION.

REPORT OF THE DIVISIONAL DIRECTOR.

The Director-General. Wellington, 25th June, 1921.

I have pleasure in submitting herewith the annual report of this Division for the year ended 31st March, 1921.

T. W. Kirk, Director.

Introduction.

The following are the principal activities dealt with by the Horticulture Division:—

(1.) Instruction in fruit and vegetable production; inspection of orchards, vineyards, gardens, and nurseries, and affording information as to the most up-to-date methods of controlling diseases and insect pests; also giving advice as to suitable varieties of fruit, vegetables, &c., to plant.
(2.) Administering fruit-export regulations and the regulations relating to the sale, for consumption within the Dominion, of New-Zealand-grown fruit.
(3.) Demonstrations and instruction in the grading and packing of fruit, and in pruning and spraying.
(4.) Testing new brands of spraying-compounds for the purpose of ascertaining their efficacy under local conditions.
(5.) Affording advice on the preserving of fruit and vegetables both for commercial and domestic purposes; cool storage; advances under the Fruit-preserving Industry Act.
(6.) Advice on orchard shelter, hedges in general, &c.
(7.) Control of the horticultural stations at Te Kauwhata, Tauranga, and Arataki, and the experimental orchard at Papanui.
(8.) Registration of all orchards and nurseries in the Dominion.
(9.) Orchard-tax: Issuing of tax-demand notices, &c.
(10.) Inspection of all imported fruit, plants, vegetables, bulbs, &c., at the ports of Auckland, Wellington, Christchurch, Dunedin, and Bluff; also inspection and grading of all locally grown fruit, plants, vegetables, &c., intended for export.
(11.) Viticulture and winemaking: Giving advice on the growing of grapes, both outdoor and under glass, the control of pests and diseases, and on the making of wines.
(12.) Affording information on beekeeping generally and the production of honey for market.
(13.) Inspection of apiaries and instruction in up-to-date methods of controlling disease.
(14.) Grading of honey for export; registration of honey-export brands.
(15.) Registration of apiaries.

The Fruitgrowing Industry.

The 1920-21 season, generally speaking, can be regarded as having been a favourable one from a fruitgrower's point of view, and satisfactory prices are being realized for clean well-graded fruit. Weather conditions were suitable for the proper carrying-out of orchard operations—cultivating, pruning, spraying, &c.

In most districts the crop of apples and pears was a good one, particularly in Canterbury and Otago, where the crop of stone-fruits was also very satisfactory. In other localities stone-fruits were medium to light. In the Auckland District a record area was planted out in strawberries, and a large crop harvested. A considerable number of returned soldiers have turned their attention to the growing of this class of fruit. An increase in the acreage devoted to tomato-growing is also noticeable. The lemon crop has been a light one, owing to injury from frosts which occurred during June and July.

The requests for information and advice on the many points connected with fruit and vegetable growing continue, and the time of officers of the Division is fully taken up attending to these and

other matters connected with their various duties. Reports received from the field officers indicate that the majority of returned soldiers who have taken up fruitgrowing for a livelihood are making satisfactory progress. Considerable time has been devoted to attending to their requirements in the matter of advice and practical demonstrations.

The estimated area planted in commercial orchards during the year is 402 acres, which is a slight decrease as compared with the previous year's figures. The area (in acres) planted during the 1920 planting season in the respective districts is as follows: Whangarei, 25; North Auckland, 80; South Auckland, 30; Poverty Bay, 30; Hawke's Bay, 75; Manawatu and Wairarapa, 2; Nelson, 30; Motueka, 50; Marlborough, 5; North Canterbury, 40; South Canterbury, 10; Otago, 25: total, 402. The total area of registered commercial orchards for the whole of the Dominion is now 29,696 acres.

During the year a new orchard-inspection district was created in the Nelson Province, where fruitgrowing has made rapid strides during the last few years. This comprises the Tasman and Moutere Hills, the Orchard Instructor's headquarters being at Mapua. An Instructor has also been stationed at Gisborne, which district was previously worked from Hastings. Both these subdivisions are undoubtedly steps in the right direction, and will enable more attention to be given in the smaller districts thus created.

Orchard Diseases.—As mentioned in my last report, an outbreak of fireblight disease in fruit-trees unfortunately occurred in the Auckland District towards the end of the year 1919. Steps were at once taken by the Department to combat the disease. The bulk of the field officers of the Horticulture Division were concentrated in the affected area, and a number of temporary inspectors appointed to assist in locating and cutting out infection wherever found. A strong fireblight committee of Auckland District growers was formed, and rendered valuable assistance in coping with the trouble. Regulations preventing the removal of certain plants from the Auckland District were brought into operation, and steps were also taken prohibiting the movement of bees except under approved conditions. Although good work has been carried out, it is recognized that to satisfactorily deal with fireblight the total eradication of hawthorn, which acts as a suitable host for the disease, is necessary. The question as to the manner in which this work will be undertaken is at present receiving consideration.

Where proper steps have been taken the ordinary diseases found in orchards have been kept under control. Brown-rot in stone-fruits has been less pronounced. The pear-leaf midge has made its appearance in the Auckland District, and steps are being taken which it is considered will control this pest.

The majority of commercial growers now realize the necessity for the application of modern methods in combating fungus and insect pests, and it is gratifying to note that hand-power sprayers are being slowly but surely replaced by modern motor-power machines. There are still, however, a considerable number of growers who, although given reasonable opportunity, neglect to take proper measures for the control of diseases and pests. It was found necessary during the period under review to take proceedings under the Orchard and Garden Diseases Act against a number of such persons in different districts throughout the Dominion. The Department is loath to take such action, but, unfortunately, there are some people who must be prosecuted if clean orchards are to be attained. It is hoped that these prosecutions will act as a warning to others failing to comply with the requirements of the Act.

Export of Fruit.—As mentioned in my previous report, a commencement has again been made in the export trade in fruit, which had ceased in 1916 owing to unsettled conditions brought about by the war. A total of 34,585 packages—consisting of 33,576 cases apples and 1,009 cases pears—were shipped to London in the first two months of the year under review, the whole of the fruit being consigned through the New Zealand Fruitgrowers' Federation (Limited), Wellington. The following are particulars of the shipments made:—

Steamer.	Date of Departure.	Apples.	Pears.
		Cases.	Cases.
S.s. "Athenic"	4th April, 1920	14,757	238
S.s. "Port Napier"	18th April, 1920	12,416	771
S.s. "Corinthic"	2nd May, 1920	6,403	..
Totals	..	33,576	1,009

With the exception of a small consignment from Hawke's Bay the whole of the fruit was sent from the Nelson District. Reports received from the High Commissioner, London, indicate that the bulk of the apple shipments arrived in good condition and realized very satisfactory prices, no claim being made on the Government guarantee of 1d. per pound. Varieties reported on favourably were Jonathan, Munroe's Favourite, Delicious, Cleopatra, and Sturmer Pippin. Cox's Orange Pippin was again found to be a bad carrier, and very few of this variety arrived in a marketable condition. The majority of the pears, unfortunately, opened up in a more or less damaged state.

Towards the end of the year it was arranged for Mr. G. Stratford, Orchard Instructor, Christchurch, who had been granted six months' leave of absence to visit England, to make a special inspection and report on the condition, &c., of fruit shipped to London during the 1921 season, and to secure all information likely to be of value in connection with the future export of fruit from the Dominion. The results of his investigations should prove of great benefit to the fruit industry as a whole.

The following figures show the number of cases of fruit exported in each export season since 1911: 1912, 14,869; 1913, 33,000; 1914, 67,964; 1915, 62,164; 1916, 19,246; 1917-19, nil; 1920, 34,585.

Demonstrations and Lectures by Orchard Instructors.—Although interfered with to a large extent by fireblight inspection, this work was carried on as far as was practicable during the winter months. The practical advice given in pruning, spraying, &c., and the information imparted on the control of orchard diseases, is apparently greatly appreciated by those interested, the attendance at such demonstrations being in the majority of instances very satisfactory. Besides the instruction given in the ordinary course of their duties, officers of the Division have frequently attended special classes at the Trentham, Tauherenikau, and Pukeora military institutions, and given lectures and demonstrations on the various branches of both fruitgrowing and beekeeping. Advice has also been supplied on the laying-out of the ground at these places, and plans provided.

Classes in Apple Grading and Packing.—Considerable interest is being manifested in these classes, which are held during the year in the main commercial centres. Four persons gained the Department's certificate in fruit-grading, eleven a first-class certificate in fruit-packing, and four a second-class certificate in fruit-packing. The total number of certificates issued to date are—Ten first-class certificates in fruit-grading, twenty-eight first-class certificates in fruit-packing, and six second-class certificates in fruit-packing.

Spraying Experiments.—These experiments have been continued during the year, the bulk of the work being conducted at the Arataki Horticultural Station, Hawke's Bay, and the Papanui Experimental Orchard, Christchurch. Tests were carried out for the control of red mite, woolly aphis, black-spot, codlin-moth, powdery mildew, and brown-rot. Various new spraying-compounds were also tested in order to ascertain their merits for the control of certain diseases. The main results as they come to hand are published in the Department's *Journal*, and are of value to growers who are anxious to keep abreast of the times in the management of their orchards.

Miscellaneous Experiments.—During the year experiments in tobacco and strawberry culture were commenced in the Auckland District; also green-manuring tests at Loburn, in North Canterbury. Particulars of the results obtained are not yet available, but these will appear in the *Journal* in due course.

Co-operative Fruit-testing Areas.—Some twenty-six of these plots still remain in operation in different parts of the Dominion. Valuable information has been obtained from these areas, which serve to show what varieties of fruit-trees are best suited to particular districts, and are also an excellent means of demonstrating up-to-date methods in pruning, spraying, cultivating, &c.

Fruit Cool Storage.—The comprehensive experiments undertaken last year in the picking, handling, and packing of fruit for cool storage were continued by the Orchard Instructor at Hastings (Mr. W. H. Rice). This year's test was designed to ascertain: (1) The best stage of maturity at which to pick fruit for successful storage; (2) the value of wrapping as against non-wrapping of fruit prior to storage; and (3) the effect of russet on the value of fruit for storage. Eight varieties of apples and three varieties of pears at different stages of maturity were used for the carrying-out of the test. The results of the experiment again demonstrated the important bearing that proper selection, handling, and transit to store have on the ultimate successful cool storage of fruit. Full particulars appeared in the January, 1921, number of the *Journal*.

Fruit-preserving Industry Act.—Several applications were received during the year for advances under this Act for the erection of fruit-packing sheds, extension of cool stores, &c. Grants to the amount of £3,500 were made, which brings the total advances to date up to £88,000. Cool-storage chambers—one with a ten-thousand-case capacity and a smaller one to hold two thousand cases—were also erected privately in the Hawke's Bay District.

Sale of New-Zealand-grown Fruit for Local Consumption.—Regulations under the Orchard and Garden Diseases Act relating to the sale of New-Zealand-grown fruit of specified kinds for consumption within the Dominion have been formulated, and came into force on the 15th April, 1920. These regulations provide for standard grades, packages, and marking. In addition, all owners offering fruit for sale are allotted a registered number, which must be branded on the cases in characters of 1 in. block type. Growers generally recognize that these regulations are a step in the right direction, and little difficulty has been experienced in getting them to fulfil their obligations.

Orchard Registration and Orchard-tax.—During the year 6,812 commercial orchards were registered, and a similar number of orchard-tax demand notices sent out. The amount collected in tax was £1,939. As mentioned in previous reports the moneys thus received are paid over to the New Zealand Fruitgrowers' Federation (Limited), less cost of collection, and are utilized in furthering the interests of the fruitgrowing industry in the Dominion. A considerable amount of work is involved in the sending-out of reminders to those persons who neglect to register or fail to pay the tax on due date.

Registration of Nurseries.

A total of 491 nurseries were registered and certificates issued; this represents an increase of thirty-seven as compared with last year. The enforcement of the nursery regulations has resulted in considerable improvement in the standard and cleanliness of stock in nurseries.

Horticultural Stations.

Te Kauwhata (Lower Waikato).

On the whole the season was very favourable for the carrying-out of the work of this station in its various branches. Excellent crops of fruit were secured, and suitable weather conditions

enabled fungoid and insect pests to be easily kept in check. In the vineyard a splendid crop of grapes was harvested in first-class condition. The fruit-trees on the fruit-farms have made good headway, the apples setting a very fair crop. All the shelter-belts have made good growth.

The 40 acres sown in oats yielded a heavy crop, averaging 2 tons 5 cwt. to the acre. A small area of early potatoes produced a good crop free from blight. The main crop was also satisfactory, there being no signs of disease. The lucerne plot (autumn sown) is still holding well. Two cuttings were harvested, and a third growth was fed off. On account of the shortage of labour no bark was stripped in the wattle plantation.

An excellent demand still continues for wines manufactured at the station. The following are particulars of wines sold during the year: Frontignac, 5,473 gallons, value £4,651 18s.; Madeira, 1,017 gallons, value £876 2s.; Claret, 539 gallons, value £377 10s.; Hock, 333 gallons, value £242 16s.; unfermented, 20 gallons, value £18 0s.: total, 7,382 gallons; value £6,166 6s.

Arataki (Hawke's Bay).

Another very dry season has been experienced, and as a result plant-growth was very disappointing. Pastures commenced to burn up in the early part of December, and by the middle of the month not a green blade was to be seen. Absence of frosts in the early spring enabled stone-fruits, with the exception of apricots, to set well. Plums developed fairly satisfactorily and yielded average crops. Many of the varieties of peaches, however, were very much undersized, notwithstanding that they had been properly thinned and the soil well cultivated. This was no doubt largely due to the hot dry winds experienced, which similarly affected both apples and pears. The whole of the bearing trees in the apple, peach, and pear sections were used for various spraying experiments, which constitute a feature of the work carried out at this station. The dry weather, however, suited the grape-vines, the yield of fruit being the best that has been produced for some years. Many of the varieties that failed to reach maturity in previous seasons ripened satisfactorily this year. Owing to the unsuitable growing-weather many of the resistant-stock cuttings and grafted vines failed to strike, and there were barely sufficient to fill the orders booked. In the vegetable-garden the early-sown varieties matured fairly well, but the majority of those planted later were practically a failure. Tomato-plants, although not attaining any great size, yielded a fair crop. Plants in the herb-garden, with the exception of foxglove, made very little progress, owing to lack of sufficient moisture. The latter has made moderate growth and gives promise of yielding a fair crop next year provided weather conditions are favourable.

Some 778 persons, seeking information and advice in the various branches of fruitgrowing, visited the station during the year. Two field-days were held under the auspices of the Hawke's Bay Fruitgrowers' Association; both meetings were well attended.

Tauranga (Bay of Plenty).

The past season has probably been one of the best experienced in the Tauranga district as far as growth is concerned, the weather conditions being all that could be desired. The apple crop, where not affected to any extent by fireblight disease, was very satisfactory. Unfortunately, this portion of the orchard suffered severely from the ravages of fireblight, and considerable work was entailed cutting out infected wood throughout the season. The trees in the test orchard have made good growth; several of them developed the disease, but the infected wood was immediately removed, and so far little damage has resulted in this area. Considerable interest is still being manifested in the citrus-testing plot, the results obtained in which have been taken full advantage of by a large number of new settlers and visitors to the district desirous of information on lemon-growing, for which the locality seems well adapted. All varieties of lemons have made vigorous growth, and the older trees are commencing to bear heavily. The avocado or alligator pears are growing well, and withstanding frosts; seeds received from the Cook Islands are now germinating in the glasshouse. Pomegranates flowered freely, but so far have set no fruit. In the nursery a large number of seedling stocks are now under way—principally sweet orange and rough lemon. The sour stocks received from California have all commenced growth, but will not be vigorous enough for budding for another season. Comprehensive tests with different varieties of tomatoes have been conducted, and trials continued with maize, kumaras, and sugar-beets. Spray-testing for control of orchard diseases has been carried out during the year. Some five thousand forest-trees were planted on the rough slopes, and a portion of the swamp cleared and drained.

PAPANUI EXPERIMENTAL ORCHARD, CHRISTCHURCH.

When taken over two years ago the trees in this orchard were old and considerably neglected. The objects the Department had in view were: (1) To demonstrate that pests and diseases of fruit-trees could be successfully controlled by the spraying-compounds recommended by the Department for the purpose; (2) to test new spraying-compounds; and (3) to try out theories in reference to the control of orchard pests and diseases. The results obtained have been most successful, both from the viewpoint of the Department and that of the fruitgrower, the present highly improved condition of the orchard serving as a valuable object-lesson of what can be done by adopting correct and up-to-date methods. The orchard has proved of very great value to orchardists in the district, and there is a constantly increasing number of visitors interested in the work. Two very successful field-days were held, there being a very good attendance on each occasion.

AVONHEAD TRAINING-FARM.

The fruit-trees planted out on this area have made fair growth and are free from disease. Of the berry fruits, loganberries and currants have succeeded best; gooseberries have suffered from

winds, while the strawberries also were poor. Activities in the vegetable section were considerably curtailed owing to the difficulty of obtaining labour; the small quantity of vegetables grown were marketed. It is regretted that no students offered themselves for instruction in fruit and vegetable culture.

School of Horticulture.

The establishment of a Dominion School of Horticulture is a matter that has demanded attention for some considerable time. Further representations have been received from the fruitgrowers' and nurserymen's associations and others, pointing out the great need of such an institution. It is trusted that before long something definite will be done in connection with this important matter, as at present there is an entire lack of facilities in this Dominion for the study of horticulture, and this want is retarding various branches of the industry.

Hops.

According to the Government Statistician's figures the area devoted to hop-growing in the 1919–20 season was 440 acres, practically the whole of this being in the Nelson Province. The quantity of hops exported during the year was 1,765 cwt., valued at £19,201. The following figures show the quantity and value of hops exported from the Dominion during the last five years ended 31st March: 1917, 4,449 cwt., £17,708; 1918, 2,134 cwt., £9,541; 1919, 2,294 cwt., £12,830; 1920, 1,946 cwt., £14,903; 1921, 1,765 cwt., £19,201.

Imported Fruit.

The following figures show the quantity of fresh fruit and fruit products imported into New Zealand during the year, the previous year's figures being also quoted for purposes of comparison:—

	1920–21.		1919–20.	
	Quantity.	Value.	Quantity.	Value.
		£		£
Fruit, fresh, dutiable	1,587,765 lb.	31,029	1,891,017 lb.	33,972
„ „ free	23,599,048 lb.	239,182	19,039,317 lb.	150,207
„ bottled and preserved	243,367 doz.	168,816	64,630 doz.	38,225
„ dried	11,911,744 lb.	478,284	9,450,103 lb.	311,312
Lemon and orange peel in brine	408,840 lb	7,034	132,433 lb.	2,486
Fruit-pulp and partially preserved fruit ..	58,474 lb	1,632	195,042 lb.	3,679
Totals	..	925,977	..	539,881

Inspection of Imported Fruit, Plants, and Vegetables.

The Fruit Inspectors report that the bulk of the fruit imported came to hand in good condition. Great care has again been exercised in the inspection of fruit from the Cook Islands (Rarotonga), especially in the case of bananas, which, however, have given every satisfaction, the cases being well filled and honestly packed. Oranges from these islands have been very free from fruit-fly infection, the system adopted of picking and storing the fruit several days before packing for shipment having given good results. Although the bananas from Fiji were of better quality than those received last year, there is still room for considerable improvement in size and packing. A few lines of oranges from Australia infected with fruit-fly had to be destroyed, and several consignments of lemons and pineapples affected with live scale and mealy bug required fumigating before delivery could be given. A quantity of maize imported from Fiji was of poor quality, and came to hand badly infected with Angumois moth and weevil, necessitating similar treatment. A number of packages of bulbs badly infected with bulb-mite were condemned and destroyed.

The following is a summary of all fruit, vegetables, &c., examined at the different ports of inspection during the year ended 31st March, 1921. The considerable increase on the previous year's figures shown is accounted for principally by the return of shipping to normal conditions.

Port of Entry.	Fruit.				Plants, Vegetables, &c.			
	Total.	Destroyed.	Fumigated.	Reshipped.	Total.	Destroyed.	Fumigated.	Grand Total.
	Cases.	Cases.	Cases.	Cases.	Packages.	Packages.	Packages.	Packages.
Auckland ..	402,916	226	633	..	29,778	18	8	432,694
Wellington ..	124,848	103	404	..	24,597	72	..	149,445
Christchurch ..	46,708	79	..	..	2,859	15	..	49,567
Dunedin ..	12,943	141	..	..	6,427	..	..	19,370
Bluff	4,895	..	20	..	2,116	..	..	7,011

Vineyards and Vinehouses.

There has been a slight increase in the area planted in vineyards, the total now being approximately 460 acres. The past season has been a very favourable one for vines, both outdoor and under glass, and good prices have been realized for the fruit. In the vineyards the grape crop was above the average, the vines yielding heavily in most localities. Owing to the suitable weather conditions diseases were easily kept under control, and fruit ripened in splendid condition. It is estimated that the yield of wine will be 75,000 gallons, which, reckoned at the conservative estimate of 6s. per gallon, represents a value of £22,500.

The number of glasshouses in the Dominion is approximately 876. Very few have been erected during the year, owing to the greatly increased cost of labour and materials. The yield of grapes under glass was, generally speaking, very satisfactory, the total crop being estimated at 550,000 lb., which, at 1s. 6d. per pound, has a value of £41,750. A number of returned soldiers have taken up the cultivation of grapes, both outdoor and under glass, this class of work being well suited for partially disabled men.

In October last the position of Vine and Wine Instructor, rendered vacant by the retirement of Mr. S. F. Anderson, was filled by the appointment of Mr. J. C. Woodfin, who has had considerable experience in wine-producing countries on the Continent and also in New Zealand.

Beekeeping Industry.

The beekeeping industry in the Dominion is making steady progress. A good honey season has been experienced; weather conditions being favourable to the development of the clover pastures, the resulting honey crop was above the average. Although the prices for honey have fallen in common with other commodities on the Home market, it is considered that the prospects for the honey-producer still remain good. The demand for information and instruction in beekeeping still continues, and several new commercial apiaries have been established. The educational side of the work has received attention, and lectures and demonstrations have been given throughout the year by the Apiary Instructors in their respective districts. The attendances generally have been very satisfactory, and keen interest was manifested in the proceedings.

The inspection of apiaries has been carried out as systematically as is possible with the present staff. Further assistance is, however, required in order that this work may be dealt with in a more thorough manner. It was found necessary to take proceedings under the Apiaries Act against a considerable number of persons for failing to take proper steps for control of disease, and also for keeping bees in box-hives.

Export of Honey.—During the past year the following quantities of honey were graded for export: Auckland, 2,930 cases; Wellington, 1,253 cases; Lyttelton, 1,422 cases; Timaru, 561 cases; Dunedin, 667 cases; Bluff, 284 cases: total, 7,117 cases. The graders report a general improvement in the lines sent forward to the grading-stores. More care and attention are now being paid to packing and branding. Fermenting and liquid honey were again responsible for a number of lines being rejected. While the present style of cap used on the honey-tins has served its purpose for a number of years, there is ample reason to believe that it is not giving satisfaction on the English market. The cap is liable to be displaced in handling, and as a result the honey deteriorates and sets up fermentation. It would appear that a screw cap, similar to the American pattern as used on their bulk containers, is a more satisfactory method of sealing the honey for export. If this or a similar cap were introduced in the export of New Zealand honey, producers would be able to ship their supplies with much more confidence. According to figures supplied by the Customs Department 7,633 cwt. of honey, valued at £30,962, was exported during the year. The following figures show the quantity and value of honey exported from the Dominion during the last five years ended 31st March: 1917, 1,572 cwt., £3,554; 1918, 2,819 cwt., £7,991; 1919, 6,619 cwt., £32,018; 1920, 9,975 cwt., £34,141; 1921, 7,633 cwt., £30,962.

Certificates in Beekeeping.—The State apiary at Ruakura, under the management of Mr. A. B. Trythall, continues to attract a large number of persons seeking a knowledge of beekeeping. During the past year some forty cadets attended the course of instruction, of whom twenty-two passed the examination and obtained the Department's certificate of proficiency, fourteen of these being returned soldiers.

Queen-rearing Apiary, Tauranga.—The beekeeper in charge, Mr. S. C. Rhodes, reports that a remarkably short season was experienced at this apiary, following a rather hard winter for the bees. Anxiety over the food-supply was not allayed till the middle of November, and the storage of surplus honey virtually ceased early in January. Considerable increase in strength was made, however, there being at present 87 full colonies and 214 nuclei, or 301 colonies in all. Orders for queens were considerably less than those received during the 1919–20 season; this was no doubt largely due to the enforcement of quarantine restrictions on account of the outbreak of fireblight in the Auckland Province. In all, 107 queens were sold—13 select, 32 tested, and 62 untested. Various improvements have been effected in the lay-out of the apiary; "poilite" sheets have been placed under the hives; and a very popular observatory-hive made and stocked with bees.

Avonhead Farm Apiary.—This apiary consists of fifty-three colonies. The beekeeper, Mr. Hight, has been kept busy instructing the soldier students in a full course of beekeeping. Operations covering spring, summer, autumn, and winter management have been carried out in order to fully demonstrate the best methods of working an apiary on commercial lines. Altogether nine students have received training, but only three have taken advantage of the full course of instruction. Some of the learners, finding that the work was not suited to their health or that they were not adapted for beekeeping, attended for a short period only. A honey-house suitable for present requirements

has been built, and is now being used in connection with the working of the apiary. The whole of the work is under the direct supervision of Mr. E. A. Earp, Apiary Instructor.

Registration of Apiaries.—All apiaries of from one hive upwards required to be registered at the triennial registration which took place during the month of June last (1920). To date, some 6,375 persons, representing a total of 84,326 hives, have registered. There are still, however, a fairly large number of beekeepers who have not done so, and this has necessitated proceedings being instituted against several such persons to enforce the regulations. The action taken should act as a warning to others who have not yet registered. The compiled lists of registered beekeepers are of great assistance to our officers in carrying out systematic inspection in the various districts.

Staff.

In conclusion I have to thank all officers attached to the Division for the manner in which they have carried out their respective duties during the year. As I am retiring from the Service on superannuation at the end of June, I take this opportunity of tendering my thanks for their loyal and valuable assistance rendered at all times in the past in the carrying-out of the many and varied activities dealt with by this branch of the Department.

AGRICULTURAL INSTRUCTION AND EXPERIMENTAL FARMS BRANCH.

Introduction by the Director-General.

The activities of this branch of the Department were well maintained during the year. No appointment has yet been made to the directorship, the control having remained under my general charge, with the assistance of Mr. A. H. Cockayne and Mr. B. C. Aston, while Mr. J. L. Bruce has superintended the larger experimental farms.

The work of the agricultural instruction service is of a twofold character, one part comprising that of actual direct instruction and advice, the other consisting of demonstrational and experimental work having as its object the determination of sound agricultural practices and the solution of the problems that confront the farmer in every district. This demonstrational and experimental work is carried out either on areas controlled by the Department, such as at Puwera, where gum-land problems are being investigated, and Winton, where the economics of pasture-production under Southern conditions are being studied, or on subsidized farms, such as at Stratford and Manaia, where practical dairy-farming on up-to-date lines is being demonstrated, and the adequate feeding of dairy cows and its relation to production is being determined. In addition, single-purpose demonstrations and experiments in co-operation with farmers, dealing with liming, top-dressing, and general crop-production, are being carried out in various districts. So far as direct advice and instruction is concerned, this is handled by means of correspondence, personal visits to farmers where desirable, meetings and demonstrations on farms and experimental areas, illustrated lectures, and the dissemination of agricultural literature both mimeographed and printed. Further, the Instructors are largely concerned in the boys' and girls' clubs and farmers' competitions movements, and their services are in request for the judging of agricultural exhibits at shows.

From a consideration of the work carried out by the Instructors during the past year it is clear that these officers are fulfilling not only a function that is of great importance to the agriculture of the country, but also one which is welcomed and appreciated by the farmer. During the past few months it has been found impossible for the Instructors to accede to the whole of the requests that have been made for their services, a fact which confirms the necessity for a strengthening of the staff.

Mr. A. W. Green, Manager of the Ruakura Farm, which has further advanced in its development on educational lines, must be accorded great credit for the good work he has done. The Weraroa Farm has shown continued improvement, and the Manager, Mr. W. J. McCulloch, has worked hard and well to bring this about. His efforts are thoroughly appreciated.

During the year Mr. A. Macpherson, Fields Instructor in charge of the Canterbury District, retired on superannuation after some twenty years' service with the Department. I take this opportunity to record an appreciation of his varied services and of the value of his mature experience and energy in relation to many branches of the work. He was succeeded by Mr. F. E. Ward, Instructor in Agriculture, Wellington, Mr. F. W. Greenwood being appointed to the latter district. In the Otago District Mr. R. P. Connell, Instructor in Agriculture, Dunedin, resigned after about a year's good service to take up other employment. His successor is Mr. R. B. Tennent, who took charge in November last. Since the close of the official year Mr T. W. Lonsdale, who for some years had successfully filled the position of Manager of the Moumahaki Experimental Farm, has resigned from the Service to take up farming on his own account. He carries the good wishes of the Department for equal success in his new venture.

C. J. Reakes.

Agricultural Instruction Service.

The following are reports (abridged) furnished by the officers in charge of the instructional work in each district:—

Auckland: T. H. Patterson, Instructor in Agriculture, Auckland.

Investigation and Demonstration.—Further substantial progress has been made at Albany and Puwera, particularly at the latter, with the work of breaking in gum lands of the types represented by these two areas. At Albany the aim has been, on this better class of gum land, to assist the small settlers locally. Linseed has been grown very successfully, also root crops, including soft turnips, swedes,

mangolds, and carrots. Kikuyu-grass (*Pennisetum clandestinum*), roots of which were imported from Rhodesia, has given very promising results both at Albany and Puwera. At Puwera a permanent pasture, with paspalum, white clover, and Lotus major as the permanent and Italian rye-grass and red clover as the temporary elements, is now established on the best tilth that we have obtained so far, and the pasture is being watched carefully to observe and record its behaviour under stocking with sheep, cattle, and horses. It has been demonstrated that even under average conditions of rainfall on the northern gum lands useful and profitable supplementary forage crops can be grown successfully. Having established crops with the best cultivation methods as a basis, it is now our intention to tackle the adjoining areas on which the virgin tea-tree and stunted shrubs are growing, and grass them by surface-sowing mixtures of seeds with paspalum as the permanent ingredient. If permanent pastures can be maintained economically, then the gum lands may later be utilized for various types of farming. (For further particulars the May, 1921, issue of the *Journal* may be referred to.)

Preliminary arrangements have been made to commence work at the experimental area of 15 acres taken over by the Department at Aria, twenty-four miles by road from Te Kuiti. There is a butter-factory at this centre, and the object of the work on the area referred to is to assist settlers in this and surrounding districts who are giving up grazing as their main calling and going into dairying. One of the chief investigations will be the control of fern, both bracken and soft or water varieties. Demonstrations with forage crops suitable for dairy cows will also be a major consideration.

Co-operative Trials.—A co-operative trial of root crops was begun last spring near Putaruru with a local settler. Owing to an unfavourable season, caused by drought, the root crops failed. Further trials will be carried out in the forthcoming season, including the sowing-down of permanent-pasture mixtures and the growing of supplementary forage crops for dairy stock and sheep.

In order to investigate the control of the root fungus known as *Rhizoctonia medicaginis*, which has shown up in many lucerne areas in the Waikato, the pumice country, and the Bay of Plenty, co-operative trials have been commenced with Mr. J. G. Raine, near Te Awamutu, and Mr. L. B. Dougherty, Cambridge. The former has had rhizoctonia in his crop of lucerne for a couple of seasons, and has willingly co-operated with the Department in setting out experiments with the object of discovering a means of control.

At Motuihi Island various mixtures of artificial fertilizers were used in conjunction with autumn-sown grass in 1920. A proprietary manure known as "Radio," which contains a considerable percentage of coal-dust, was used in a careful trial, particulars of which were published in the *Journal* for March, 1921.

Advice and Instruction to Farmers.—The demand from farmers for experimental areas, co-operative plots, and advice on agricultural matters has increased very much, and it has been increasingly difficult to cope with the work with the present strength of staff. Callers at the office are on the increase, and the work is so arranged now that at least one officer is usually in attendance there. Farmers are using the small herbarium of economic plants which has been set up in the office, and it is proving of practical value. The practice is growing slowly among farmers of sending in unknown plants for identification and a report as to their agricultural value. A small reference library has been added during the year, and officers of this as well as other Divisions are making use of it. It is apparent from inquiries that come from Farmers' Union officials and other local bodies devoted to country interests that farmers are depending less on their memory for retaining useful knowledge. They are finding books recommended by the Instructors in Agriculture useful. A show-case containing ranges of seeds and manurial samples has been set up during the year and has proved useful. In addition, the case contains exhibits of crops, which helps instructional work.

Lectures and Practical Demonstrations.—Lectures have been given on various subjects of local interest throughout the Whangarei, Northern Wairoa, and Kaipara sub-provincial districts, and also to various country bodies in districts south of Auckland City. Series of lectures have been given by Mr. Smallfield, Mr. Dibble, or myself to soldier trainees and cadets at Ruakura Farm of Instruction, and also to teachers and farmers attending special schools at Ruakura. The subjects covered have dealt chiefly with soils, manures, lime and liming, cropping, and feeding of stock. Useful discussions with a practical bearing have followed these lectures. Questions dealing with local problems are usually answered after the lectures.

Several demonstrations on ensilage have been given during the year. The practice of encouraging farmers to meet on Government areas or private farms to have what is known as a "field-day" is growing in popularity. On these occasions pastures are examined, pasture elements identified, and their useful and other characters dealt with. Crops are treated similarly. When weather permits, this class of instruction is extremely useful.

Fertilizer-control.—Official samples of fertilizers are taken under the Fertilizers Act, 1908, and sent to the Chemist for analysis. One firm was prosecuted during the year for selling bonedust materially deficient in nitrogen, and also for not registering the fertilizer offered for sale.

Seeds.—Farmers take advantage of the facilities given by the Biology Section for testing seed free of cost. Samples of seed are frequently sent forward with the object of having tests made of germination and purity. Two samples of seed taken from a consignment sold by auction in Auckland and tested during March gave the following results: Italian rye-grass, 37 per cent. germination; colonial cow-grass, 26 per cent. germination. A farmer who wished to sell some locally grown paspalum-seed found that the Biologist's report showed the percentage of germination to be nil. Such cases could be multiplied.

Lime and Limestone.—If the analyses of the 158 soil-samples taken during the last two years indicate the lime-requirement of the province, then this expressed as carbonate is approximately 3·2 tons per acre. The great difficulty in getting farmers to use lime at all is due, firstly, to the high

indicated requirement, and the fact that, generally speaking, he can get good crops without the use of lime; and, secondly, to the extreme difficulty of getting lime without giving long notice—in some cases up to six months. That liming is a beneficial practice there is no question. There is plenty of evidence to show that it has a good effect on pastures and with most crops. That the practice of liming is growing in favour is shown by the increase in the number of companies producing agricultural lime. The Te Kuiti Lime Company is now putting out 2,000 tons per month, most of which is supplied directly to farmers. While manures were so high in price during the year the farmers' attention was directed to the use of lime. Another evidence of the increased interest in lime is the number of limestone-samples sent forward to the Chemist for analysis.

Plant-diseases and Insect Pests.—Rhizoctonia medicaginis in lucerne was the most serious disease noted during the year. Experiments are in progress with the object of finding out methods of control. Brown rust in barley has been noted. Soft rot in turnips has been observed in the Raglan district, and dodder in red clover and lucerne has been recorded in several areas in the province. Rust in cereals is not uncommon in the North, as might be expected.

Weather.—The rainfall at Auckland for the year was 51·66 in. The autumn rainfall was good, and feed throughout the province was adequate. The winter was comparatively mild, but there was a good deal of frost in July. The early spring was promising, but a dry spell set in during October and checked the root crops, particularly soft turnips. A dry spell again set in in the autumn. It was particularly bad immediately south of Auckland and through the Waikato. Dairy-farmers on small areas who had lucerne were very fortunate, as it enabled them to manage better than those who depended on grass entirely or supplemented with turnips alone. Dairy-farmers who had to depend very largely on the turnip crop were troubled with turnip-flavoured cream, which in turn produced inferior butter. In North Auckland the season was, on the whole, better than that south of Auckland.

North-west Wellington, Taranaki, Hawke's Bay, and Poverty Bay: J. W. Deem, Fields Instructor and Supervisor of Subsidized Demonstration Farms, Wanganui.

Weather.—The year was, on the whole, an unfavourable one from the farmer's point of view. The winter was the coldest for a great many years, with more frost than usual. This was followed by a wet spring on the west coast, with high winds right up to December. The rain then ceased, but the wind continued. Conditions were getting very dry early in January, but a good rain about the middle of the month saved the cereal and root crops. In Hawke's Bay practically no rain fell after October, and some of the oldest settlers state that it has been the driest season for forty years. Pastures have suffered severely, and feed has been scarce in many parts.

Crops.—The area of wheat sown was the smallest for many years, but the average yield was good; all the crop was spring-sown. The area under oats on the west coast was much about the same as last year, and in Hawke's Bay rather more. The Hawke's Bay crops were good, being well headed and saved in excellent condition. On the west coast they were not so good as last year, but were well saved. The bulk of the crop is being cut into chaff, and should average about 2¼ tons per acre. There was not very much barley grown, and most of it was in Hawke's Bay. The yields have been good, but prices were low, with a very slow sale.

In Taranaki the soft-turnip crops have been up to the average. South of Wanganui, where turnips are grown for sheep-feeding, the crops suffered from the dry weather, and the yield was light. Club-root has also been bad where the turnips followed a previous brassica crop. The area in swedes is about the same, but the yield will be very much below last year's, except in central Taranaki, where the crops are good. The dry weather at sowing-time made them slow in starting; then as the season advanced the aphis and moth were bad. Club-root has been prevalent in second crops, and dry-rot is making its appearance, but not nearly to the same extent as last year. Tap-root disease was also in evidence. The mangold crop is getting more attention, and the area sown should be greater than last year's. Many farmers are growing them in preference to swedes in districts where the latter is a risky crop. Last spring, when the swede crop rotted badly, the value of the mangold was very pronounced, especially in the August–October feeding of dairy cows and ewes. The season has not been good for mangolds, and the crop will not be heavy.

The season was only fair for kales, the second growth being poor. Rape, on the whole, has been light, but where medium crops were grown the feeding-quality was good. There has been very little second growth.

Lucerne is coming more and more into favour, and the dry season has done a lot to convince the sceptics of its value. The majority of dairy-farmers between Manaia and Wanganui either have areas in or are getting them ready to sow, and scarcely a day passes without our receiving some inquiry about lucerne. Hawke's Bay has had a great lesson in the value of lucerne this year, especially during the past three months of severe drought, and I anticipate a big increase in the lucerne areas of this province. There are parts of my district where lucerne has not yet been a success, and attempts to establish it in these localities are being carefully watched.

The general hay crop was the best for several years. In many districts the quantity saved was double that of last year, and in addition most of it was secured in good condition.

The maize crop was good in Hawke's Bay and Gisborne districts, but on the west coast very little was sown, and the crop was light. There were eight entries in the Hawke's Bay maize-growing competition, and the crops should average nearly 100 bushels per acre. The varieties are very mixed, and there is room for a lot to be done in seed-selection, which should increase the yield considerably. Growers state that they have great difficulty in getting good seed. Japanese millet is still grown for cow-feeding, particularly in north Taranaki, but there has been no extension of the area. A little ensilage has been made in these districts, but farmers generally consider the labour too great.

The early-potato crop was fairly good and not much affected by blight. For a time the main crop promised well, but turned out very disappointingly. The potato-moth has been bad in several districts. Field-pumpkins were good in the Gisborne district, and a few fair crops were grown in Hawke's Bay, but generally, owing to the dry weather, the average crop was poor. Very few were grown on the west coast this year.

Rye-grass and crested dogstail were saved under good conditions, and the seed is of good quality, with a satisfactory yield per acre. Not much cocksfoot was saved. There have been numerous complaints about the germination quality of seeds, particularly permanent-pasture seeds. Samples submitted to the Biological Laboratory show that a lot of the seed on the market was old and germinated badly, some samples running as low as 3 per cent.

Manures and Lime.—All manures have been high in price, and until recently fairly hard to procure. The prohibition of the exportation of superphosphate from Australia and the late arrival of several shipments of slag last spring were severely felt. For a time farmers had to accept anything offering and this is making itself manifest in the poor results from many of the crops. The necessity of using fertilizers with root crops and for top-dressing pastures is being more fully realized. The value of lime is now fully realized in most districts, and all that becomes available is being put on the land. Up to the present the existing lime-works have not been able to cope with the demand. Several samples of limestone and shell rock have been submitted to the Department's Chemist for analysis. Samples of soil from various districts have also been submitted to the Chemist to ascertain the lime content; these without exception have shown a deficiency in lime.

Experimental Work.—This has been mainly confined to the Stratford, Waimate West, Marton, and Rawhiti areas, but a few additional experiments on a small scale have been conducted in Taranaki and Hawke's Bay. Detailed accounts of the operations on the main areas are published in the *Journal*, brief references only being given here.

Stratford Model Dairy Farm: The experiments on this farm have been in the direction of tests between different varieties of roots for suitability and disease-resistance, growing of forage or hay crops, laying down of pastures, and a small variety test of different lucernes. Different manures have also been experimented with, both for sowing with crops and for top-dressing. The most interesting result under this heading is the good showing of basic slag and the poor results from rock phosphate, the latter having little or no effect on the pasture.

Waimate West Demonstration Area: The work started on this area has been continued. Further plots have been top-dressed, and a start has been made to establish lucerne, 4 acres having been sown during the season. Milking is being continued, and the herd is doing well.

Marton Experimental Area: The season was bad for this area; the spring being wet and cold, work was delayed. However, better harvest weather was experienced than was the case last year, and this to some extent compensated for the wet spring. The crops grown this year consisted of oats, wheat, barley, lucerne, rye-grass, clover, peas, Japanese millet, Sudan grass, maize, sugar-beet, turnips, and swedes. The balance of the area was in fallow for the destruction of couch-grass.

Rawhiti Area (Hawke's Bay): The work on this area has consisted of observing the grasses and lucerne previously sown, and the preparation by means of a rape crop of another 14 acres to be sown in permanent pasture of different mixtures. The drought conditions that prevailed practically reduced the area to a dust-bed, and further work has been deferred.

The Stratford and Waimate West farms are now fairly established. At Stratford some 70 acres have been stumped, and the crops grown have generally been good. Last year the returns of butter-fat showed an increase of over 12 per cent., and this year, notwithstanding the bad season, they show fully 30-per-cent. increase. The policy on these farms is more demonstration of good farming than experimental work, although a certain amount of the latter is being done. That the work carried out is widely appreciated is shown by the large number of people who visit these farms during the year, and the interest that is being taken in all published reports. It is the general opinion that the establishment of these farms has already been fully justified, and that their continued development will prove of great value to the districts in which they are situated. The strong points are that they are within easy reach of the people they are expected to serve; that the results obtained are applicable to the surrounding country; and that they provide places where farmers can meet and discuss farming problems not only among themselves, but with officers of the Department.

Field Competitions.—These continue to create considerable interest, and are the means of getting farmers together to see and discuss the best crops to grow and the most satisfactory methods of cultivation. Ten additional centres have started competitions this year.

Returned Soldiers.—A good number have been visited on their farms and others advised by letter. At Putorino, in northern Hawke's Bay, the returned soldiers and the settlers have formed an association known as the Putorino Settlers' Association, and the Department is co-operating with it to a small extent in carrying out some experiments. This year the work has been confined to mangold variety tests and the establishment of a small area of lucerne. As opportunity offers it is proposed to take up top-dressing and pasture establishment.

Boys' and Girls' Agricultural Clubs.—A start was made with these under the auspices of the Taranaki Provincial Executive of the New Zealand Farmers' Union, the Agriculture Department and officers of the Education Board co-operating. As the start was late it was decided to confine the work for the first year to mangold- and swede-growing competitions, and the area to South Taranaki. (A full account of the operations has been published in the *Journal.*)

Lectures and Correspondence.—During the year I have met farmers at a number of centres and given short addresses on different agricultural subjects. A considerable number of these meetings have been in the open field, and there is no doubt that such meetings are preferable to meetings in a room, provided the weather is favourable. The policy I have found most satisfactory is to briefly

open a subject and get up a discussion by means of questions. The volume of correspondence dealing with advice on agricultural subjects has greatly increased during the year, and is a great tax on time.

Wellington (except North-western Districts), Marlborough, and Nelson: F. W. Greenwood, Instructor in Agriculture, Wellington.

Weather.—Conditions were, on the whole, fairly normal throughout, and the rainfall was well distributed and about the average in total fall. The months of February and March closing the period under review were warm and dry.

Crops and Pastures.—The matter of pasture-improvement has received due attention. Lucerne has also engaged considerable attention, and is being sown in much larger areas, especially on the Manawatu coast. A number of crops have been sown in wide drills to allow of intercultivation; this may be regarded as an innovation, as the broadcast crop has almost entirely prevailed in the past. Roots were grown to about the same extent as in previous years, and where intercultivation was carried out heavy yields resulted. In some localities much damage was done by dry-rot. Potatoes were not extensively grown. The area sown in wheat showed a decrease in comparison with that of former seasons, while the area sown in oats was slightly greater. Barley showed an increase, especially in the Marlborough District. Forage crops continue to be sown as supplementary fodder for dairy stock, and the season generally was favourable to heavy yields.

Advice and Farm-inspection.—A large volume of correspondence was received requesting advice on agricultural matters. A great portion of this was answered by letter, but in many cases an inspection of the farm was necessary, the latter method being undoubtedly the better one. Very often a number of farms in one locality were visited at the same time. Considerable time was also devoted to assisting soldier settlers by means of personal advice.

Work through Farmers' Organizations.—Much useful work was done through such organizations as the Farmers' Union and the various Agricultural and Pastoral Associations. In many cases lectures were given at their regular meetings, and in some instances these were supplemented by field-days and inspections of farms where work of special interest to the district was being undertaken. Some twenty branches of the Farmers' Union were addressed, the average attendance being thirty-four. The use of lantern-slides proved a valuable adjunct, particularly during the winter months.

Demonstration Areas.—A special committee was set up by the Masterton and the Wairarapa Agricultural and Pastoral Associations to meet the Instructor and arrange for a series of demonstrations to be carried out on private farms. The object of these demonstrations was to test the local practices against suggested improvements—each area to be visited by organized parties when the crop or pasture had reached maturity. The economic aspect being of major importance, no work was undertaken which could not be profitably carried out by the ordinary farmer. Eight of such areas were established, and there is every indication that a greater number will be undertaken next year.

Lectures to Soldier Trainees.—One of the chief duties lay in giving regular lectures to trainees at the Central Development Farm, Weraroa; Wairarapa Training-farm, Masterton; Repatriation Farm, Tauherenikau; Military Hospital, Trentham; and also at the Waipukurau Sanatorium (by special arrangement with the Instructor in charge of the Hawke's Bay District). Each period of instruction was four months, and covered a course of sixteen lectures on such subjects as soils, manures, crops, and pastures. The average attendance at each lecture was twenty-two, and the interest manifested very gratifying. In certain cases lectures in dairy science were given by arrangement with the Dairy Division. Where possible the trainees attended local shows in company with the Instructor, who gave demonstrations on the exhibits.

Lime and Liming.—A large number of soil-samples for lime-requirement tests were taken from typical soils, and the results made known to the farmers in the districts concerned. Lime-deposits at Dyerville (Wairarapa), Takaka, and Upper Takaka were inspected at the request of local companies, and advice given as to the most suitable site for a plant and the best methods of dealing with the raw material.

Fertilizer-control.—Samples of fertilizers were taken for analysis from several of the manure-merchants, and one prosecution was instituted for breaches of the Act.

General.—Numerous plant-diseases and insect pests have been reported during the year, and when required specimens were forwarded to the Biologist for identification and suggestions as to methods of control. Considerable damage has been done by dry-rot of swedes; grass-grub in pastures; red-leaf on cereals, in restricted areas; and flag-smut on grasses, notably danthonia.

When visiting farms a number of seed-samples were taken for germination and purity tests, and the results obtained from the Biological Laboratory.

Canterbury and North Otago: F. E. Ward, Instructor in Agriculture, Christchurch.

Weather.—The winter of 1920 was fairly open, and there were no heavy snowfalls. During December and the early part of January very hot weather was experienced. Frequent north-westerly winds prevailed from October until the middle of January, and quickly dried up any moisture that fell. In North Otago and South Canterbury very little rain fell between September and the end of March. In this respect conditions were more favourable in North Canterbury, although in all parts of the district forage crops, such as rape, kale, &c., have in most cases been almost a failure owing to dry, hot weather during critical periods of their development. The month showing the heaviest rainfall was January, with 4·62 in., while February, with 0·98 in., was the driest. The rainfall for the year was actually above the average for Canterbury, but this precipitation was mostly in the nature of heavy showers followed by drying winds, and so was not of any great benefit to plant-life. The rainfall at Christchurch for the twelve months ended 31st March was 2·67 in. greater than that for the

same period last year, but owing to uneven distribution it was not nearly so effective from an agricultural point of view.

Pastures.—Considerable discussion has taken place regarding the condition of pastures in Canterbury. The majority of farmers still adhere to rye-grass as the dominant pasture constituent, with the result that in about two years this grass is gone and weeds have full possession. These remarks apply to North Otago as well as to Canterbury. Pasture conditions can be improved by the use of grasses suitable to Canterbury conditions, and by rational treatment during establishment and afterwards while being grazed. The farming in this district is largely of a type which necessitates the land being broken up for wheat after a short term in grass. Unfortunately, many of the lands intended for a short-rotation pasture remain in grass for many years, and in consequence the temporary pasture gives way to weeds.

Crops.—Cereals: Wheat crops yielded well, the average for this district being 33 bushels per acre, and the harvest was gathered in good time. Some take-all disease was present in South Canterbury. Bunt was prevalent where farmers did not attend to seed-dressing. North Otago crops were good and free from disease, and the milling-quality is reported to be exceptionally good. In North Canterbury sprouted wheat, caused by the January rains, was plentiful. Oat yields, with only a ew exceptions, were light. The hot north-westers caused a premature ripening on the lighter lands, and in these districts the sample is poor. Many crops of barley were in stook during the January rains, and these were damaged; the later crops, however, escaped damage. Yields in almost all cases were fairly good.

Potatoes: There was a decreased area under potatoes, and in most districts the yield will be below last year's. Blight appeared in some of the damper districts, but the attack was too late to ma erially affect the yield.

Roots and forages: The early sown crops met disaster during dry weather in November and December. Many crops were sown after the January rains, but these also were almost ruined by the dry conditions that followed. At time of writing green feed is very scarce, and even the districts along the foothills within the western rain-belt have only very meagre turnip crops this season.

Lucerne Experimental Areas.—At Darfield two crops of hay of a total weight of 4 tons were secured; at Templeton three crops of hay of a total weight of 7 tons; and at Ashburton one crop of hay of a total weight of about 4 tons. The long-continued dry weather seriously interfered with growth on the latter plot. At Bankside one crop of hay was secured on the 4-acre block, which also carried 2·94 sheep per acre per annum. The irrigation area was a decided success, giving three cuts of hay equal to a total of about 3·25 tons per acre. This plot has been visited by quite a number of farmers. The Bankside plots have demonstrated that hay is an uncertain quantity on this class of light land, which, however, shows much promise for grazing.

Co-operative Experiments.—A co-operative experiment was undertaken on the Waimakariri scrub country, on the property of Mr. H. Luers, Oxford. The portion selected is representative of an area of 60,000 to 70,000 acres of land that is virtually producing nothing. A 5-acre block was chosen and the following crops sown: Cow-grass, sweet clover, lucerne, rape, kale, and turnips and grass. All plots except the sweet clover, which did not germinate, are showing much promise. The area is so situated that irrigation can be applied, and it is intended to experiment with this factor next season.

Ashburton Experimental Farm.—The work carried out on this farm is supervised by the Instructor in charge of the Canterbury District. A comprehensive programme of work was arranged, and, with the exception of the areas put down in grass, useful results are expected. Dry-weather conditions militated against the success of the pasture experiments. A comprehensive report on the season's operations is being prepared for publication in the Department's *Journal* [since published in the September, 1921, issue].

Improved Seed-wheat.—From pedigree strains of wheat raised by the Canterbury Agricultural College and a few reliable farmers the Department purchased 10,111 bushels of the varieties Solid-straw Tuscan, White-straw Tuscan, College Hunters, College Pearl, and Velvet. These were placed on sale to farmers as seed-wheat, and it is anticipated that their high-yielding properties will play an important part in bringing about increased production.

General.—Many farms have been visited in various parts of the district to advise owners seeking information on agricultural matters, but there is still a large number on the waiting-list.

Sugar-beet seed was distributed to a number of farmers during October and November for the purpose of ascertaining the suitability of the plant for Canterbury conditions. Although this was late sown, the results have exceeded all expectations, and a high tonnage rate per acre is expected.

Mr. A. Macpherson, who for a number of years had been in charge of the fields work in Canterbury, retired in September (1920), having reached the retiring-age. Mr. R. McGillivray, Fields Instructor, was in charge until my arrival (on transfer from Wellington) in the middle of January, 1921.

Middle and South Otago and Southland: R. B. Tennent, Instructor in Agriculture, Dunedin.

Since my appointment in November last a considerable amount of time has been employed in becoming acquainted with the various problems presenting themselves in this district. The main part of this report deals briefly with some of the more salient features which have come under my notice.

Winton and Gore Experimental Areas.—The work being carried out at the Winton and Gore areas is being closely watched and appreciated by the farmers in those districts, and many useful data are being collected from the operations.

At Gore an area of approximately 30 acres is devoted to investigational work, chief among this being the sections set apart for the investigation of various plant-diseases, such as swede dry-rot, club-root, and powdery scab of potatoes. These particular experiments have been carried out under

the direction of the Biologist, and a report thereon has appeared in the *Journal*. A soft-turnip variety trial is being carried out to obtain information regarding yield, palatability, and keeping-qualities of six popular varieties. Among other trials are the following: New oat variety trial, winter forage crops, hay and smother crops, autumn-sown legumes and cereals, lucerne, and linseed. A considerable area is also devoted to the investigation of pastures.

On the Winton Area a considerable portion of the land has been devoted to the investigation of suitable grass mixtures for pastures, and various methods of treating such, special attention being given to the effects of grazing and liming. Sections have also been laid down in pure-pasture sowings, and the utility of these for grazing purposes is being noted. As at Gore, a section has been devoted to investigating swede dry-rot, and the control measures being carried out afford a good check on the results obtained at Gore. Considerable difficulty was experienced throughout the season in combating weeds, yarr being very troublesome. This was particularly noticeable in the section devoted to winter forage crops, and much work had to be resorted to in order to save them from being completely smothered. Among other crops tried out on the area were summer forage crops, oats for chaff, hay-production crops, linseed, and tares combined with various cereals.

Irrigation.—One of the most important problems presenting itself is the question of irrigation in Central Otago. To this subject I have given much attention, and have made a special report on the irrigation of Ida Valley. Undoubtedly the time is fast approaching when some serious investigational work must be carried out in Central Otago with a view to solving some of the many problems in connection with irrigation. Up to date a considerable amount of money has been expended by the Public Works Department in bringing the water to the settlers' holdings and so making it available for irrigation. Unfortunately, the best use is not made of such water, the methods of applying it being crude and uneconomical. The time therefore was ripe for the establishment of a demonstration area in the district, and it is hoped that the steps now being taken in this direction at Galloway will be of good service.

Boys' Agricultural Competitions.—A pleasing feature of my work has been in connection with the Otago boys' agricultural competitions. These competitions, held primarily under the auspices of the Otago Expansion League, have for their object the fostering of the emulative spirit of the boys of the province. Field competitions are held in which the boys are matched one against the other in the production of various crops, and as a result of such competition great keenness is taken in crop-production and agricultural productivity generally. There can be no doubt that the competitions are resulting in good, and, realizing this fact, the Department now subsidizes the Otago Expansion League to the extent of £1 for £1. In order to keep in direct touch with this work I have been appointed one of the committee responsible for the running of the competitions.

Lantern Lectures.—Numerous requests have been received for lectures on agricultural topics, and I have given a number of lantern lectures on various subjects. There can be no doubt that this method of disseminating agricultural knowledge is an excellent one, and it will be a feature of the work during the winter months.

General.—A considerable amount of time has been occupied in reporting on special subjects, general correspondence, the sampling of fertilizers, and answering inquiries from farmers or visiting them at their farms. These inquiries are increasing in number, indicating that the agricultural instruction service is becoming more widely known and appreciated in the district.

West Coast of South Island: C. S. Dalgliesh, Fields Instructor, Hokitika.

Weather.—The year was, on the whole, one of the best for a number of years. Heavy rains and rough boisterous weather occurred during the last two weeks in May, but from then until the middle of October there was good seasonable weather. Heavy frosts continued throughout August. September proved a fine month, which is unusual. The latter part of October was squally, and the whole of November was very bad, practically holding up all farming operations. Thereafter until the end of March the weather was excellent—in fact, considered by some to be too dry.

Pastures and Crops.—Pastures held out well throughout the summer, largely due to the occasional heavy rains. Old pastures are carrying too high a percentage of the Agrostis grasses, Yorkshire fog, and sweet vernal, but new ones are as a rule good, especially where lime has been applied to the land. Cropping continues to be restricted on this coast, average climatic conditions at seeding and also at harvest time making it unsafe for farmers to crop on a large scale. Some excellent crops of oats were grown during the past season, however. At time of writing there are moderate areas of turnips promising well throughout Grey Valley and Westland, but in the Murchison district they are not up to the usual standard of that locality. Carrots are doing well, as is usual in the West Coast district. An increased area of potatoes was put in, but results have not been so satisfactory as was expected. Lucerne has been experimented with in small areas, but no general success has been met with. Indications point to it being more successful on the lighter lands than on the good grass-carrying lands, and it is only on the former that I would recommend further trial.

Lime-supply.—Farmers have had continual trouble in the matter of an adequate lime-supply. Owing to the West Coast Farmers' Lime-producing Company having in hand the installation of a crushing and pulverizing plant it was February before a supply of lime was available for the southern part of the district. Murchison farmers are installing a crushing plant for the production of carbonate of lime. At Cape Foulwind (Westport), Ross (West Coast Farmers' Company), and Koiterangi an undue amount of trouble has been met with in getting men for the work required, and in securing experienced men to undertake the management of lime-burning operations. Limestone-samples have been collected throughout the district and forwarded to the Chemist for analysis; in most cases they show a high percentage of carbonate of lime. Farmers' unions and associations have been met and information supplied as to the best means of obtaining a lime-supply for the respective districts. Soil-samples collected show a lime-requirement ranging from 2 to 5 tons of carbonate of lime per acre.

Agricultural Instruction and Advice.—This work has been carried out by means of correspondence and by visiting farms. The latter method means a good deal of time, but meets with most approval from the farmer. Inquiries as to suitable grass mixtures, lucerne-culture, fertilizers, and methods of cultivation form the basis of most of the information asked for. Farmers generally are showing a greater tendency to become better acquainted with all kinds of pasture plants.

Experimental Areas.—Poerua: This area was sown down in a grass mixture which is proving very satisfactory.

Rotomanu: The area was sown in a variety test of oats last spring, the crop being harvested for hay purposes. At time of writing the area is being grazed with sheep, and will be prepared in the ensuing spring for sowing down in Lotus major and paspalum tests.

Moana (bush-terrace lands): No work has been done on this area, it having been grazed with stock, but negotiations are in progress to have further work carried out during the coming year.

Hokitika (racecourse area—bush-terrace lands with stiff subsoil followed by gravel in which layers of oxide-of-iron pan are met with at various depths): Advantage was taken of the fine weather from December onwards to have this area sown down in grass tests. Eight different mixtures were sown, ranging from a high-class permanent mixture to a short-rotation pasture leading to a permanent Agrostis and Lotus major combination. So far these grasses have done as well as if on first-class land, and it will be interesting to note how they will stand.

No further drainage-work on the bush-terrace-land class of country was undertaken. Notes on previous work done show that the shafts put down have given better results than was expected. Although this system cannot be recommended on a large scale, in places where the distance makes draining to low-lying areas expensive work the shafts serve the purpose very satisfactorily. Where these shafts have been filled in they are working as satisfactorily as where left open.

Westport (grassing demonstration): Pastures on this area are good, and are in marked contrast to those surrounding it.

Murchison (beech-bush hill-country): The pasture plots on this country have been fully reported on in the *Journal*. During the year a spring and autumn surface-sowing was carried out with various grasses and clovers to note what will "take" on this type of land under this method of seeding. The spring sowing gave poor results.

Experimental Farms.

Condensed notices of the activities of the Department's larger farm establishments, from reports made by the respective Managers, are printed below.

Ruakura Farm of Instruction, Hamilton: A. W. Green, Farm-manager.

Good progress can be recorded in all sections of the Ruakura Farm, and it has still further developed as an instructional institution. Farm-schools were held for farmers and teachers, and several instructional classes arranged for students and district-high-school boys. The members of sixteen branches of the Farmers' Union held field-days at the farm. The number of general visitors to the farm—many of them from overseas—is still increasing.

Training of Returned Soldiers.—During the year the number of returned soldiers in training was doubled, and now amounts to sixty. This work therefore represents a considerable proportion of the activities of the farm. With very few exceptions the trainees have continued to take a keen and intelligent interest in their subjects, and have entered into the practical work with an earnest desire to make good. The addition to the quarters of sleeping-accommodation for another thirty soldiers and a large lecture-room was completed during the year. These buildings are well constructed, and will prove a valuable permanent addition to the farm. The grounds are being laid out by the horticultural staff, assisted by a number of the soldiers who are taking up horticultural work. In regard to the training courses generally, it has been found that in many cases the four-months period granted is quite insufficient, and in such instances extension of time had to be allowed. Ruakura is reserved for men more or less incapacitated by their war service from the heavier types of agricultural work, and those who have had long periods in hospital cannot always be expected to show much advancement for the first few months, even light work often proving too much for them.

Crops.—The general policy in regard to agricultural work has been continued, and the usual crops grown and harvested. Root crops were, on the whole, lighter than those of the previous year owing to a dry autumn, but hay and cereal crops yielded above the average. The Ruakura oat continues to give good results, and the whole of the oat crop consisted of this variety, with the exception of plot experiments. Bobs wheat has repeatedly proved itself to be the most suitable variety for the locality, and this experience was again borne out. Black Skinless barley gave excellent results, and is to be grown more extensively during the coming season for pig-feeding. Rye-corn thrives better than any other cereal on the newly broken-in swamp land. As new areas will be stumped at an early date, seed for the sowing of them has been grown and threshed.

Pastures.—Valuable information has been gathered in connection with the establishment of temporary and permanent pastures on swamp lands. It was well demonstrated this year that when once grasses and clovers have been successfully established on this class of land it does not pay to break up the land again for years to come with the object of cropping. The method of first sowing Italian or Western Wolths rye-grass and feeding out hay containing clover and Lotus major seed to stock on these areas has met with further success, and can be recommended as sound practice.

Live-stock.—Cattle: As the result of careful breeding and management it was not found necessary to purchase females to add to the dairy herd this year. The young stock coming forward

will be sufficient to keep up the required number of cows for milk-production. Milking Shorthorns and Jerseys are the two breeds kept The demand for stud bulls is still on the increase, and the prices obtained for this year's stock exceeded those of last year. Sheep: The stud flock of Southdown sheep showed a greater return this year than in former years. In connection with the fat-lamb trade there was a brisk demand for Southdown rams, and all rams bred were disposed of at satisfactory prices. Forty stud ewe hoggets bred on the farm were added to the flock. The ordinary sheep flock comprises five hundred crossbred ewes mated to Southdown rams, and about one hundred wethers. Pigs: The herd of pedigree Berkshire pigs now consists of thirty breeding-sows, and the stock usually carried varies in number from one hundred and fifty to two hundred pigs. With the new buildings erected it has been possible to increase the number of pigs reared, and thus meet the demand. From the list of transfers recorded in Volume 2 of the Herd-book of the New Zealand Pig-breeders' Association it is shown that over 50 per cent. of the total number of pedigree pigs sold on transfer in the Dominion were bred at the Ruakura Farm of Instruction.

Horticultural Section.—A considerable amount of valuable work is undertaken by this branch, such as the propagation and cultivation of all classes of plants and trees, the planting of hedges and shelters, and the laying-out and maintenance of grounds and drives on the farm. The large collections of grasses, clovers, forage plants, and root crops are all located in the nursery area, and for instructional purposes the section is one of the most useful in Ruakura. Seed-selection plots, vegetable-gardens, and orchards are also included under horticulture, and most of the work in connection with the preparation of show exhibits is undertaken by the staff in this section.

Poultry Section.—A special endeavour was made to raise the number and further improve the standard of the stock in this section, and the work will be followed up. The number of discharged soldiers anxious to enter into poultry-keeping as a livelihood is greater than ever. There have been as many as twenty trainees receiving instruction at one time.

Apiary Section.—Throughout the season a large number of trainees was receiving instruction in this section, over forty taking advantage of the courses. A better season for honey-production was experienced, and sufficient honey was gathered for local requirements. This section is, however, almost entirely an instructional and experimental branch, and nearly all the time of the officer in charge is engaged in giving demonstrations and delivering lectures to trainees and beekeepers.

Central Development Farm, Weraroa: W. J. McCulloch, Farm-manager.

Satisfactory progress has been made at this farm during the year. Together with the practice of up-to-date farming methods, improvements and repair work in fencing, plantations, and buildings have received careful attention.

Climatically the season experienced was somewhat abnormal. The swede crop was specially affected, this interfering with the variety and manurial tests. Mangolds, however, gave satisfactory results. The lucerne stand of 11 acres established during the previous season is giving opportunity for dealing with local problems in the maintenance of this crop, especially as regards weed-control, and it is intended to treat the stand in plots by various methods of cultivation. Heavy crops of oats and tares, affording a good demonstration of weed-smothering, were harvested for hay. Cereal crops for chaffing and threshing gave very satisfactory yields. A further 90 acres was laid down in various grass mixtures.

Live-stock on the farm has been maintained in excellent condition. As regards dairy cattle, the testing of milk-yields was again carried on, and gave very satisfactory results in both the Friesian and Red Poll herds. The minimum yield of mature Friesians has now been brought to something over 400 lb. of butterfat. Both herds carried off a number of first-class honours at various agricultural shows. The annual sale of surplus animals was held with successful results. A large number of sheep was fattened commercially, and a prolific lamb crop disposed of satisfactorily. The pig section was further developed, and a fair number of stud Berkshires sold, also a large number of commercial animals not required as studs. Tests in pig-feeding gave considerable practical information as regards grazing and the use of concentrates.

A number of field-days were held during the season at the request of various branches of the Farmers' Union, all proving successful. Visits were also received from the Palmerston North Boys' High School agricultural pupils.

The training of discharged soldiers was carried on as previously, and every opportunity given to those willing to learn the practical side of farming. The men also had opportunities of acquiring further knowledge by means of lectures.

Moumahaki Experimental Farm, Waverley: T. W. Lonsdale, Farm-manager.

Useful demonstration work on the best farming practices for this part of the Dominion has been continued at Moumahaki, and the farm has been maintained at a high standard generally.

Cereals and field-peas yielded well, and harvesting was completed during ideal weather. Owing to dry weather, crops of rape were light; turnips, swedes, and mangolds were fairly good. Potatoes are small, but of good quality and sound.

During the year various new manurial trials were inaugurated, comprising top-dressing of pasture and tests with mangolds and potatoes. Calf-rearing trials with various foods, to a great extent eliminating milk, were again conducted. Experiments in the fattening of lambs on peas and the winter management of hoggets were carried out. A bankside pit system of ensilage-making was tried and proved a decided success. An area of 7 acres has been devoted exclusively to the production of cocksfoot, and will be cut for seed during the coming summer.

The general health of live-stock on the farm has been good. The Ayrshire herd is maintaining its reputation, and all bulls bred met a ready market. The flock of Ryeland sheep is increasing in numbers, with a high standard of breeding. The herd of Berkshire pigs is being well maintained.

General.

West Coast of South Island Experimental Farm. — Since the purchase last year of land at Waimaunga, in the Grey Valley, for the purpose of an experimental farm, about three-fourths of the total area of 150 acres has been limed and is now being brought into cultivation. It is hoped that by the end of next season the farm will be ready for stocking with dairy cattle, the demonstration of sound farming methods, including the breeding, feeding, and management of purebred dairy cattle, being one of its chief functions. Owing to the extremely high prices required, the Department has so far been unable to have farm buildings erected, but the property has been securely fenced with both boundary and subdivision fences, and further development will be undertaken in due course.

Economic Investigation of the Montane Tussock-grasslands.—This investigation, conducted by Dr. L. Cockayne, has been continued during the year. Much interesting and useful information has been obtained and published in the *Journal*. Correlating this information with data afforded by the observation enclosures established at various points in Central Otago, it is expected shortly to arrive at a number of important conclusions, which should be of great assistance in measures taken for improving the very large area of tussock-grassland country.

CHEMISTRY SECTION.

REPORT OF THE CHEMIST

The Director-General. Wellington, 5th July, 1921.

I FORWARD herewith the annual report of the Chemistry Section for the year ended 31st March, 1921.

B. C. ASTON, F.I.C., F.N.Z.Inst., Chemist.

Introductory.

A further increase in the work of this Laboratory for the year is here reported. Three new lines of work have been undertaken—namely, (1) the determination of the quality of wheat from the percentage of flour it will yield when ground in a model mill, known as the "milling test" (see note in *Journal* of the Department for November, 1920: "Testing of New-Zealand-grown Wheats"); (2) the analysis of casein for export; and (3) the examination of samples of New Zealand leather.

The first-named work is still in the experimental stage, but it is hoped to publish some account of the results obtained shortly. The thanks of the Department are due to the technical officers of the Public Works Department, who have successfully installed the machinery for this work.

A number of applications have been received from trading firms for assistance in the analysis of various samples. As this Department makes no charge for analysis, and has never undertaken this class of work, there seems less reason than ever for doing it now that there are a number of analysts in private practice and in the employ of the various University colleges who are willing and allowed to do so. The principle that has hitherto guided the Department in accepting work for the Chemical Laboratory is, in intention, that the results must be of public interest and utility, while at the same time private rights are not interfered with. A private analyst would have just cause for complaint if the Department analysed fertilizers for trading firms, but would have no objection to the Department undertaking a lengthy investigation into some chemical problem affecting a large body of the public, in which work the private analyst could not hope to compete profitably.

The staff generally has worked enthusiastically and efficiently under somewhat crowded conditions, and the junior members are showing their desire to advance in the profession of chemistry by attending classes at the local University College. A Chemical Section of the local branch of the New Zealand Institute has been formed, in which the senior members of the staff are taking a leading part.

Soils.

The collection of soil-samples, owing to various circumstances, had to be confined to those taken by the Instructional staff of the Department for the purpose of ascertaining the lime-requirement. It cannot be too strongly emphasized that the Instructors should not take samples of limited areas which do not represent any large tract of country. Garden-soils should, of course, never be collected, and it is difficult to see what good can result from the testing of a swamp soil—largely organic matter—the lime-requirement of which is invariably so high that to satisfy it would be impracticable. An article entitled "Lime-requirement of New Zealand Soils and Lime-development" was published in the *Journal* for June, 1920. Further articles on the Manawatu soils have been published in the August and September, 1920, issues of the *Journal*. In these the humus soils, loams, and Otaki sands were dealt with.

The following table shows the number of soil-samples received from the various districts, and the average lime-requirement expressed as a percentage of carbonate of lime. The method used, as in previous years, was the unmodified Hutchinson-MacLennan method.

Number of Samples collected.	District.	Average Percentage of Carbonate of Lime ($CaCO_3$) required.
34	North Auckland	0·46
22	South Auckland	0·40
7	Taranaki (Stratford district)	0·43
20	Hawke's Bay	0·26
4	North Wellington (Raetihi district) ..	0·57
13	Manawatu	0·27
7	Wairarapa	0·26
11	Marlborough	0·17
31	Nelson	0·33
5	West Coast	0·44
22	Otago	0·23
31	Southland	0·42
Total 207		

Fertilizers.

Administration of the Fertilizers Act.

The samples drawn under the Fertilizers Act for the period under review were more than double the number taken during the previous year. Even this number is, however, short of that which should represent the samples taken in order to ensure that the Act is being generally complied with.

Of the fertilizers analysed for the purposes of the Fertilizers Act, twenty-two unofficial and fifty-three official samples were received. Of the unofficial samples three (or 13 per cent.) were found to be deficient to the prejudice of the purchaser. Of the official samples eight (or 15 per cent.) were found to be deficient. Convictions were recorded in all cases which were brought before the Court. The details of these cases have been duly published in the *Journal* from time to time.

The returns of the importation of fertilizers have been collated and published every quarter in the *Journal*, in which the annual figures, with a review by the Chemist, have also appeared (June, 1920).

Phosphates.

The scarcity of several popular kinds of fertilizers, such as basic slag, superphosphate, and bonedust, has drawn attention to the possibilities of finely ground high-grade island phosphate, such as that from Nauru and Ocean Islands, in which the New Zealand Government has now so large an interest. To make known the facts of the matter articles have been prepared and published in two issues of the *Journal*—namely, "Phosphates: The Present Position," in July, 1920, and "The Use of Nauru Island Phosphate: Efficacy of the Ground Raw Material," in December, 1920. It is satisfactory to learn that the writer's opinion as to the value of finely ground phosphate on New Zealand soil is borne out by British and American authorities.

The Wallaceville pasture top-dressing experiments should go far to demonstrate in a practical manner the value of raw phosphate rock. A further article on this series of field experiments was published in the *Journal* for October, 1920, and another has been prepared for publication.*

The prediction (see *Journal* for February, 1919) that economy of phosphates could be effected by applying lime to land which has been heavily phosphated in the past and which still requires dressing to obtain profitable results has obtained support from an experiment at the Ruakura Farm of Instruction, where 1 ton of burnt lime gave 2 tons 8 cwt. of hay, while 3 cwt. of Ephos phosphate gave only 2 tons 9 cwt. The reason for this phenomenal success with lime on light soils is suggested in the June, 1919, *Journal*, page 80.

Nitrogen from the Air.

One must notice the report by Mr. Evan Parry entitled "Nitrogenous Manures in New Zealand" (*Journal of Science and Technology*, September, 1920, Vol. 3, No. 3), in which the suggestion, discussed in this Department's *Journal* for September, 1919, that the Bowen Falls, (Milford Sound) should be "harnessed" to manufacture nitrates for artificial fertilizers received his disapprobation.

Dairy Products.

The analysis of samples of butter, cheese, and milk have been continued as in previous years, and casein has been added to the list of substances tested for export. The large number of export butters which were submitted for verification of the grader's test of water-content and found to contain more water than is allowed, necessitating reworking to lower the water-content before being permitted to leave the country, should be noted. Of forty-six samples analysed forty-one were found to contain water in excess of 16 per cent.

* Since published in *Journal* for July, 1921.

Stock-foods.

Evidence is not wanting of the necessity for legislation dealing with artificial stock-foods, including those substances now sold as calf-food and pig-food. It seems necessary that such legislation should provide that in addition to the usual guarantee as to the amounts of the food ingredients—fats, carbohydrates, and proteins—the vendor shall disclose the name and portion of the plant or plants from which the food is made. For instance, it would seem quite possible for a meal to be placed on the market showing by analysis a high food-value if its content of fat, carbohydrates, and protein only be given; whereas the additional information suggested above might show it to contain the seeds of poisonous plants, rendering it not only valueless but positively detrimental as a stock-food.

Insecticides and Dips.

The need for comprehensive legislation dealing with insecticides, spraying-compounds, and stock-dips becomes more apparent as our knowledge of the presence of agricultural pests in New Zealand increases. To cope with the cattle-tick, arrangements were made with the Director of the Live-stock Division for one of his officers to be given instruction in the Chemical Laboratory in the rough testing of the fluid in the cattle-dip, to ascertain whether the dip was maintained at a state of working efficiency during its use. Sets of testing-apparatus and reagents have also been prepared for this testing-work and forwarded to the officers responsible. A proposed amendment to the Stock Act, dealing with sheep-dips, was proposed last year, and it has been decided to proceed with the voluntary registration of sheep-dips; but the writer considers that an Act on the lines of the American Insecticide Act, dealing with all such compounds, is desirable.

Lime.

The committee of Government experts—consisting of the Chemist (convener), the Assistant Engineer-in-Chief of the Public Works Department, and the Director of the Geological Survey—appointed to assist and advise those interested in working limestone-deposits, as mentioned in last year's annual report, has kept in touch with developments in this direction. It was thought that such a combination of engineering, geological, and chemical effort would be able to advise on any set of circumstances which was preventing the supply of lime to a district, and how best to remedy the shortcoming. The committee has dealt with and reported on a number of applications received during the year. The first of a series of articles on this subject, by an engineering officer, dealing with the proper types of machinery and kilns for producing lime and limestone for agricultural purposes, was published in the *Journal* for March, 1921.

In the Laboratory a large number of specimens and samples of limestones and reputed limestones, received from the public and from officers of the Department, have been tested for agricultural value. Certain soft limestones have been examined for putty-making, and other earthy materials have been similarly tested. A local factory has been instrumental in making practical tests of these raw materials, and has been assisted in utilizing these and other raw materials of indigenous origin. In my last report the suggestion was made that the mineral part of putty, which was then entirely imported, might be obtained from New Zealand sources. It is satisfactory to know that putty is now being successfully made from New Zealand chalk, about 2 tons of this and 10 tons of distemper having been made by a Wellington manufacturer.

The importance of the lime industry in New Zealand may be gauged by the fact that in the year ended 31st March, 1920, 102,010 tons of limestone were quarried for agricultural purposes.

Tanning Barks and Materials.

A number of tanning-materials derived from native trees have been assayed for tannin content, and the results published in the *Journal* for February, 1921. This is a work which will probably increase in the near future, as the recent establishment of a State Forest Service will tend to promote intensive forestry operations, of which tanning-materials are one of the most important by-products. So far, the study of New Zealand vegetable tanning-materials has been confined to the bark of trees. It is intended to extend the examination to the wood and leaves. The cladodes (false leaves) of the *Phyllocladus* were suggested as a source of tannins by the late Professor T. Kirk. Examination of one specimen has shown that they contain an appreciable amount. Information is therefore accumulating as to the value of all parts of this native tree. Its quick growth, highly ornamental appearance, hardy nature, capacity for growth on poor soils, small amount of sap-wood, excellent quality of heart-wood, high tannin content of the thick bark, and now the value of the leaves and twigs for tanning, render it a fit subject for forestry research as possibly one of the few New Zealand trees which might be raised to a profitable maturity.

Toxicological.

A comparatively large amount of this work has been carried out during the year. As in the past, the greatest difficulty was found in obtaining adequate specimens or samples. Although the confidence of the sender in the analyst's capacity to fathom the cause of death from very slender evidence is flattering, it is none the less to be lamented that his efforts are frequently unavailing owing to the want of judgment displayed by the sender in the selection of specimens.

Two interesting cases of poisoning occurring in travelling stock are recorded in the *Journal* for April, 1921. In one of these the symptoms recall those of a previous case having some similar post-mortem symptoms (*Journal* for June, 1918). In this case *Ranunculus* (buttercup) plants

were the suspected poison; in the other case a caustic salt of sodium was evidently the cause of death. The lesson to be learnt from these cases is the importance of extreme care in tending driven stock when they are in such a ravenously hungry and thirsty condition that they will eat any vegetable or drink any liquid.

Sugar-beets.

A small number of sugar-beets obtained from five different sources were examined and the results published in the *Journal* for October, 1920. The large size of the beets grown in New Zealand, coupled with the high yield per acre and the good percentage of sugar, indicate that the possibility of successfully establishing the beet-sugar industry in the Dominion should certainly be fully investigated.

Commercial Leathers.

A number of samples of leather have been examined to discover whether any injurious compound has been used which, while cheapening and hastening the process of manufacture, would tend to lower the quality of the finished product. Sulphuric acid was found in one sample in amount which indicated that it was added in the manufacture, and would probably result in an inferior product which would tend to crack in dry weather. This inquiry would seem to show that some supervision of the leather industry is required.

Miscellaneous Work.

In addition to the work already mentioned in this report the Director-General and other responsible officers of the Department have from time to time been advised on various minor matters of a chemical nature in which they were concerned.

Samples received.

The following is a list of samples received during the twelve months under review: Soils collected by field officers, 254; miscellaneous soils, 41; fertilizers sampled under the Fertilizers Act (official and unofficial) samples, 81; miscellaneous commercial fertilizers, 70; reputed fertilizers and phosphate rocks, 55; milk, 10; butter for export, 53; casein, 10; potable waters, 18; various other waters, 3; stock foods, 2; sheep and cattle dips, 5; spraying-compounds, 4; commercial quick or caustic lime, 4; limestones (natural), 240; commercial ground limestones, 6; paint, paint-making materials, and diatomaceous earths, 27; tanning barks and materials, 24; toxicological specimens, 20; sugar-beets, 6; wheats for milling test, 27; leathers, 17; miscellaneous specimens, 46: total, 1,023.

Limestones tested.

The following is a list of the more useful limestones tested during the year. The results are given in percentages of carbonate of lime ($CaCO_3$) on samples as received, the preceding letter and figures being the Laboratory record number.

North Island.

Hokianga County: M 553A, 67; M 553B, 68, M 553C, 74.
Bay of Islands County: M 941, 87 (unground shells).
Hobson County: M 67, 89 (hard grey stone with a vein of calcite); M 68, 69.
Whangarei County: M 260, 66; M 261, 67; M 262, 68; M 510, 78.
Otamatea County: M 32, 51; M 69, 75; M 185A, 66; M 185B, 62; M 248, 91; M 249, 91; M 250, 91; M 251, 92; M 253, 62; M 254, 75; M 255, 75; M 256, 71; M 257, 79; M 258, 82; M 259, 76; M 655, 62; M 936, 79 (ground limestone); M 937, 75 (ground limestone).
Rodney County: M 11, 76; M 12, 82; M 13, 57; M 14, 71 (very soft material); M 15A, 60; M 15L, 96 (sinter); M 16, 75; M 17, 85; M 18, 72 (very soft material); M 43, 78; M 123, 80 (marly stone); M 124, 51; M 416, 76 (marly stone); M 557, 65 (soft white stone); M 558, 54; M 703, 86; M 704, 56 (marly stone); M 705, 68 (marly stone).
Waitemata County: M 71, 78 (marly stone); M 72, 79 (marly stone); M 73, 56 (marly stone); M 291, 71 (marly stone); M 406, 75 (marly stone); M 407, 72 (marly stone); M 554, 53; M 641, 64 (marly stone); M 642, 66 (marly stone); M 643, 55 (marly stone); M 806, 91 (ground limestone); M 807, 71 (ground limestone); M 862, 70 (ground limestone).
Eden County: M 35, 97; M 36, 90; M 37, 88; M 38, 78.
Manukau County: M 822, 74; M 823, 70; M 824, 73 (soft sinter).
Piako County: M 40, 71.
Raglan County: M 284, 50 (soft marly stone); M 736, 51 (marly stone); M 737, 50 (marly stone); M 739, 59 (marly stone).
Waitomo County: M 153, 98; M 154, 97; M 425, 94; M 619, 79 (limestone screenings); M 638, 96; M 639, 75; M 640, 86; M 817, 84; M 818, 83; M 819, 87; M 820, 67; M 837, 92; M 838, 94; M 839, 96
Ohura County: M 114, 82; M 115, 82.
Egmont County: M 880, 81 (sinter).
Waitotara County: M 340, 67; M 341, 52; M 342, 68; M 601, 96; M 602, 60; M 871, 77.
Rangitikei County: M 63, 66.
Pohangina County: M 587, 70 (soft shelly limestone).
Pahiatua County: M 89, 85; M 90, 94; M 91, 94 (friable white stone, needing no grinding); M 92, 95 (friable white stone, needing no grinding); M 93, 75.
South Wairarapa County: M 677, 91 (ground limestone).
Hauraki Plains County: M 309, 88 (shell deposit); M 310, 73 (shell deposit); M 311, 86 (shell deposit); M 312, 84 (shell deposit).
Opotiki County: M 851, 78 (crushed shell); M 842, 80 (finely ground shells).
Cook County: M 556, 86 (ground limestone).
Wairoa County: M 614, 75.
Hawke's Bay County: M 102, 62 (calcareous sand); M 240, 88 (soft limestone).
Waipukurau County: M 752, 86; M 753, 82; M 754, 83 (shelly grit).
Dannevirke County: M 895, 72.
Patangata County: M 307, 74; M 669, 71 (shelly rubble).

South Island.

Takaka County: M 283, 93 (soft limestone); M 293, 97; M 294, 99; M 295, 96; M 296, 94; M 297, 95; M 298, 72; M 405, 85 (finely divided carbonate of lime); M 863, 89 (sinter).
Waimea County: M 174, 95; M 175, 91; M 695, 96; M 696, 88.
Sounds County: M 520, 53 (shell deposit).
Buller County: M 34, 61; M 162, 86; M 163, 97; M 164, 94 (sinter); M 410, 97; M 411, 98; M 412, 98 M 413, 94 (sinter); M 414, 98; M 415, 94.
Murchison County. M 157, 89; M 288, 90; M 289, 89; M 290, 70.
Kaikoura County: M 702, 82.
Amuri County: M 625, 96; M 626, 96; M 627, 47 (soft carbonate of lime); M 515, 70 (soft carbonate of lime); M 516, 86 (soft carbonate of lime).
Waipara County: M 623, 68; M 624, 68; M 825, 62; M 826, 55; M 827, 72; M 828 58; M 829, 70 (soft carbonate of lime); M 831, 57 (soft carbonate of lime).
Geraldine County: M 96, 86.
Levels County: M 95, 63 (marl).
Peninsula County: M 109, 74; M 110, 83.
Tuapeka County: M 199, 76 (sinter); M 313, 86.
Clutha County: M 714, 92 (ground limestone); M 715, 93 (ground limestone).
Southland County: M 481, 94 (limestone boulder); M 757, 57; M 870, 87; M 870A, 91; M 870B, 91.

BIOLOGY SECTION.

REPORT OF THE BIOLOGIST.

The Director-General. Wellington, 28th September, 1921.

HEREWITH I submit my annual report dealing with the main operations of my section during the year ended 31st March last.

A. H. COCKAYNE, Biologist.

REMOVAL OF LABORATORY.

Subsequent to my return from the United States in March, 1920, it was decided to remove the Biological Laboratory from the Central Development Farm, Weraroa, to Wellington. After considerable difficulty a house was purchased in Fairlie Terrace, some twenty minutes from the Head Office. This building has been converted into excellent laboratories devoted to seed-testing, agronomy, plant-pathology, mycology, and entomology. The new quarters are in every way convenient and appropriate for the work performed by the Section, and represent a great advance on any previous accommodation provided. With but slight alterations, that could later be easily effected, they should remain suitable for the biological work of the Department for many years to come.

SEED-TESTING.

During the year 8,800 seed-samples have been tested for purity and germination. This is the largest number that has been dealt with in any one year, and clearly indicates the importance that the seed trade attaches to this work of the Department. As 10,000 samples per year represents about the maximum capacity of our present seed-testing equipment, increase both in staff and apparatus will shortly be necessary.

Compared with the results of previous years the standard of the 1920–21 grass-seed crop is high. Especially is this the case with cocksfoot, which for some years had shown a falling-off in quality.

A very thorough investigation with regard to loss of germination of Chewings fescue exported has been carried on in co-operation with the United States Department of Agriculture. This investigation has not yet been completed, but it has already been shown that if shipments are made of new season's seed as early as possible in the autumn no deterioration occurs. This fact is of great significance and importance, and means that if merchants ship early an excellent and lucrative trade can be secured with the United States, where Chewings fescue is in the highest repute for lawns and golf-links. Provided satisfactory germination can be assured there is a market for some thousand or more tons annually in that country.

During the year a considerable amount of experimental work on seed-testing has been carried out, and modifications have been devised that render the work far more reliable and efficient than has previously been the case.

PLANT-PATHOLOGY.

During the past year over a thousand specimens have been sent into the Laboratory. These specimens cover a wide range of economic plants, including fruit-trees, vegetables, flowers, field-crops, cereals, and forest and ornamental trees. The mycological herbarium of the Section has been increased largely during the year, and reflects great credit on Mr. G. H. Cunningham. As a publication on the diseases of fruit-trees is in preparation a great deal of attention has been paid to orchard fungi, and many hitherto unknown and unrecorded diseases have been studied.

Fireblight.—The outbreak of fireblight in the Auckland Province has resulted in a steady stream of specimens into the Laboratory either infected with or suspected of being infected with the disease. In the course of the work of examination it has been found that certain diseases such as "black-rot" are far more widespread and injurious than was currently supposed. Since its appearance in

the country fireblight has been repeatedly isolated and constantly kept under observation in cultures in the Laboratory. It has been isolated from medlar (*Pyrus germanica* L.), grown in culture, and inoculated into this host, where it formed characteristic fireblight lesions, recovered in culture, and inoculated into pear and hawthorn, again producing fireblight lesions. Mr. R. Waters, who has carried out the whole of the cultural work relating to this organism, has evolved a cultural method of diagnosing fireblight which is rapid and certain. It is based on the appearance in forty-eight-hour colonies of internal radiate characters, a feature hitherto undescribed in the literature on the subject. Numerous laboratory experiments have been carried out with a view to determining the lethal effect of various chemical substances, organic and inorganic, on this organism. Chemicals that have in the laboratory shown marked lethal effects have in varying quantities been injected into trees infected with fireblight, with the object of ascertaining whether they will have any effect as a controllant of this disease. So far results have not been encouraging. Several articles on fireblight by various members of the staff have appeared from time to time in the *Journal* and other publications.

Powdery Scab of Potato.—This disease, known as *Spongospora subterranea*, has been present for many years in New Zealand, but it is only of very minor consequence in potato-growing, and has not called for any adoption of control measures. Its presence in New Zealand is now, however, of considerable significance, as the Australian Commonwealth has prohibited the importation of New Zealand potatoes into Australia owing to the disease being in the Dominion. Efforts to lift this embargo were unavailing, and a commission of which the writer was a member visited Australia and placed the facts before the Australian authorities. They, however, remained firm in their determination to exclude potatoes from New Zealand, but finally decided to send over a potato expert to examine the main potato areas of the Dominion. He, however, reported against the lifting of the embargo, and there the matter stands. It would not be really a very difficult matter to eradicate powdery scab from New Zealand were disease-free seed alone used and planted on disease-free land. It is, however, very difficult to persuade farmers to adopt these methods, owing to the fact that the presence of the disease in New Zealand affects neither the quality or quantity of the crop. There is reason to think that the Australian authorities will later recognize the non-economic importance and easily controllable nature of powdery scab, and then the embargo may be lifted.

Entomology.

Routine correspondence in connection with insects and insect diseases sent in for diagnosis occupies a very considerable amount of time. During the year Mr. J. Myers, F.E.S., was transferred from the Chemistry Section, and his services have been of great value in enabling Mr. D. Miller, Entomologist, to carry out important field-work without breaking the continuity of the work of this branch of the Laboratory.

Owing to the depredations of the pear-leaf-curling midge in the Auckland Province, where it has become impossible to grow young pear-trees on account of this pest, a special investigation into the insect's life-history was undertaken with a view to control. The life-history has been worked out in detail, and it has been shown that owing to certain features a practical method for control will not be difficult. The investigation has now reached the stage where control methods on an extensive scale can be tried out to determine which will best fit in with the general orchard work of the year. The detailed life-history of the orchard red-mite, which is perhaps the most difficult of all orchard pests to properly control, has also been commenced, and this should lead to the formulation of methods superior to those at present in vogue.

An investigation into the maggot-flies attacking sheep has shown that two species—namely, *Pollenia stygia* and *Lucilia sericata*—are responsible, and the distribution of these two flies is being studied.

The life-history of the ordinary grass-grub has been worked out, and many features have been shown to be of great significance in control. During the year the main insects of plantations, especially *Eucalyptus* plantations, have been investigated, and a publication on forest insects is being prepared and should be issued shortly.

In addition to ordinary routine and investigational work many additions have been made to the entomological collections during the year. These are now rapidly assuming considerable dimensions, and will be of the utmost value in the prosecution of future research in economic entomology.

Pure Seed-wheat.

One of the worst features with regard to wheat-growing in New Zealand is the very mixed character of the majority of the seed-wheat used. The Canterbury Agricultural College (Lincoln) has clearly recognized this fact, and Dr. F. W. Hilgendorf has and is carrying out work of the greatest value in the production of pure strains of our main commercial wheats. Certain farmers again have selected pure-strain wheats of great value. The Canterbury Seed-growers' Association, formed some years ago and subsidized by the Department, owes its origin to the necessity for an organization to deal with the distribution of such pure strains, and also to enable a continuous supply of really pure seed to be available from year to year. The work of this association in the distribution of pure seed-wheat has been of the highest importance to wheat-growing in New Zealand, but as it was unable to deal with large quantities of wheat it was decided that the Department should take over the work of crop-inspection and seed-distribution previously carried out by the association. This has been done, and nearly 14,000 bushels of pure seed-wheat has been purchased and sold to farmers at a price that just covers the costs of purchase and distribution. The great success of this method of improving the wheat industry of New Zealand strongly calls for the continuance of the work in future seasons, and it is hoped that in a few years nothing but crop-inspected pure-strain wheat will be sown in the Dominion.

Sugar-beet Production.

The trials in the growing of sugar-beet at the Ashburton Experimental Farm, the Central Development Farm (Weraroa), the Marton Experimental Area, and the subsidized farms at Manaia and Stratford have created a great deal of interest in the question as to whether a beet-sugar industry could not be profitably developed in the Dominion. The high yields secured, varying from 18 to 24 tons per acre even under not particularly favourable conditions, and the satisfactory sugar content indicate that so far as the actual growing of the roots is concerned the crop presents no more difficulties than does the ordinary mangold. The especially satisfactory results secured at the Ashburton Farm were largely responsible for the efforts that have been made by private enterprise in Canterbury to establish a sugar-beet growing and manufacturing company. So far, however, nothing tangible has resulted, mainly through lack of adequate financial support.

The question as to whether development in this direction should be encouraged is one that will have to be decided one way or the other, and in order to secure some information regarding sugar-beet growing under ordinary field conditions the Department has distributed a considerable amount of beet-seed to farmers in both Canterbury and Otago. Judging by the number of requests made for trials with this seed it appears as if the Canterbury farmer, in particular, would be quite prepared to undertake the production of this crop on commercial lines. When in Victoria, in August, I spent some time in the Maffra district, where the only beet-sugar factory in Australia is located, and made a general investigation of the industry as carried on there. On my return I submitted a report, the main features of which are included in an article in the last January issue of the *Journal*. Since my return I have been much impressed with the great suitability of many parts of Canterbury for the growing of sugar-beet, and if the industry is ever attempted to be developed the initial efforts should be undertaken in that province.

One point with regard to beet-sugar production has not previously been sufficiently stressed, and that is the large amount of labour that would be absorbed in the manufacturing end of the business from, say, the end of May to the end of September. This would fit in remarkably well with the slack period of our meat-works, and beet-sugar factories located in the vicinity of meat-works would be of mutual benefit so far as the labour question is concerned.

Lectures.

During the year a large number of lectures to farmers have been given by myself and members of my staff, mainly under the auspices of the Farmers' Union and of fruitgrowers' associations. These lectures are illustrated with lantern-slides, and the generally large attendances clearly indicate the favour with which this class of extension work is viewed by the farming community. Requests for lectures and lecture tours have, however, become so numerous that it has been found possible to deal with only a small proportion of them.

HEMP-GRADING SERVICE.

REPORT OF THE CHIEF HEMP-GRADER.

The Director-General. Wellington, 10th May, 1921.

Herewith please find my annual report for the year ended 31st March, 1921.

W. H. Ferris, Chief Hemp-grader.

Volume of Production.

The quantities of hemp and tow received at the grading-stores of the Dominion for the year ended 31st March, 1921, show a decrease of 8,032 bales as compared with the previous year's figures. This decrease is accounted for by the continuous floods in the spring, rendering many of the mills unable to work owing to the flooded state of their swamps; a considerable drop in the price of hemp accompanied by high cost of production; the strike of employees in the Foxton district at the latter end of the season; and the loss by fire of a two-stripper mill at Makerua, one stripper at Invercargill, and one at Westport. The decrease at the various grading-ports was as follows: Wellington 1,118 bales, Auckland 4,080 bales, Foxton 1,838 bales, and Bluff 996 bales.

Prices.

The average f.o.b. prices per ton obtained for phormium-fibre for the past year are as follows: Hemp—Good-fair £32, high-fair £30, low-fair £27, common £24. Tow—First grade £14, second grade £13, third grade £11. Compared with the previous year these prices show a decrease of £1 10s. on both good-fair and high-fair, while the price of tow has increased in all grades by £6 per ton.

Quality of Fibre.

As can be seen from the attached tables the quality of the hemp during the past year (except that from the Marlborough, Wairoa, and Southland districts) cannot be regarded as satisfactory, low-fair and common grades comprising 26 per cent. of the total gradings at the three chief ports—Wellington, Foxton, and Auckland. The production of so much high-fair and low-fair grades at those ports may be attributed to the small difference in the prices of good-fair (which should be our standard grade) and low-fair. At one period during the season the difference between the London

quotations for the two grades was as small as £1 per ton, and though it has slightly increased it is still far less than the difference in the respective values of the grades. Under such conditions many millers were content to aim no higher than the high-fair grade, and frequently some defect occurred which caused this grade to be missed and the fibre adjudged low-fair or perhaps common grade. In still greater measure has the production of an inferior article been due to careless workmanship on the part of the millers.

It is to be regretted that many millers endeavour to make their output as close to the bare requirements of a grade as possible, instead of trying to produce a fair average sample. Such lines have a very detrimental effect on the market, and also make it exceedingly difficult to know exactly where one grade begins and the other one ends. Some millers, however, are worthy of much commendation for the high standard of quality of fibre reached by them. These evidently have the welfare of the industry ever foremost in their minds and study the most advantageous methods of production in every detail, so that their fibre is not only suitable for binder-twine, &c., but may come into use for the manufacture of commodities of higher value, and thus ensure a steady demand.

In point of quality Marlborough district still retains the premier position, followed closely by Canterbury and Wairoa (Hawke's Bay). Southland millers also deserve praise for the satisfactory standard of hemp milled by them during the past year. Compared with the previous year good-fair has increased from 8 per cent. to 37 per cent., with a corresponding decrease in low-fair of from 44 per cent. to 13 per cent.

Washing and Bleaching of Fibre.—In many cases there is not sufficient care exercised in this branch of the milling process—a branch in which it is impossible to be too careful, especially in the production of a good quality of fibre. The fielding or bleaching is also neglected in many instances, it being quite obvious that the hanks of fibre have been too thickly spread. This practice allows the fibre to retain certain undesirable matter—especially the acid natural to the leaf—not already removed by the washing process, and thus prevents the fibre from being properly bleached.

Another defect arises from the spreading of fibre on bare soil, or from allowing it to become covered with long grass. This causes it to become discoloured and detrimentally affects its strength. Bleaching under such conditions is difficult and unsatisfactory, and many lines of hemp, although well stripped and scutched, have to be awarded very low grades for these faults.

Dressing the Leaf.—While the improved "spring-spindle" strippers have eliminated one of the chief drawbacks to the preparation of phormium—the bruising and breaking of the fibre—there is a tendency under the new method to go to the other extreme and produce a fibre of too coarse and wiry a character. Not only is the body of such fibre too strong, but it is very difficult, owing to the incomplete elimination of the vegetable matter, to secure a good colour. There are already quite enough coarse fibres on the foreign markets, and manufacturers look to the better grades of New Zealand phormium to provide them with a soft free thread.

These improved machines have worked a revolution in stripping, owing to their having obviated the rigidity which caused the bruising of the fibre; but care must be taken that too much "give" is not allowed, so that while the fibre is free from bruises and straws, it is thoroughly stripped. Unfortunately, there is more or less cause for complaints from the manufacturer in this connection.

Unsatisfactory Scutching.—Unsatisfactory work in scutching was again very much in evidence during the past year. As this branch of the work is invariably done under the contract system the tendency is, generally, to aim at quantity rather than quality, with the result that during the year many lines had to be placed in a lower grade than that which the quality of the body of the fibre merited. During the past few years faulty work in this part of the milling process has been responsible for nearly all complaints received from manufacturers, who complain bitterly of this weakness in our fibre.

The tails of the hanks consist of fibre extracted from the tips of the leaves which, being finer than the body of the blade, have a tendency to pass through the stripper without being properly treated. As a result the body of the fibre bleaches more rapidly than the poorly stripped tail, and in most cases effective scutching is impossible unless the tails are clipped or fine hackles attached to the beaters of the drum of the scutcher. Hackles are used in practically all the mills in the South Island to eliminate the tail trouble, but so far this method has not been adopted by the millers in the North Island.

The classing of green leaf also does not receive the attention that its importance deserves. In a great many cases short, long, and diseased leaf is fed indiscriminately into the stripping-machine, so that when scutching the resultant fibre it is impossible to treat the shorter lengths contained in the hanks. In such a mixture the long and well-scutched good fibre has to be graded down with the inferior. To overcome this difficulty and ensure uniform scutching it is absolutely necessary that the green leaf should be sorted into uniform lengths before being stripped, and if this method were adopted by millers the resultant fibre would be of an even and better quality, and more appreciated by manufacturers.

Tow.

The quality of the tow produced during the past year was satisfactory, but at the same time fully 50 per cent. of that placed in No. 2 grade would, had a little more attention been paid to the shaking of this by-product and so getting rid of the dust, have been awarded first grade.

There has been an exceptionally big demand for tow during the past year, and the prices received have been very good, being an increase of £6 per ton on each grade as compared with the previous year.

Stripper-slips.

Owing to the high prices ruling for tow during the past year stripper-slips were more in demand, and the whole of the output was purchased by the Mataura paper-mills, Otago, the average price being £6 per ton f.o.b. Wellington.

Position of the Hemp Industry

The general position in regard to the hemp industry of the Dominion at the present time, unfortunately, is that the quality in the larger centres is gradually going back, and has been for the past five or six years. The industry has therefore been adversely affected by the large production of low-grade fibre, and unless some united action is taken by the millers whereby the hemp will be prepared with much more care, and only lines of a uniform quality forwarded to the grading-stores, our fibre will be neglected by the overseas trade for fibres of a more even quality.

The ease or difficulty with which manufacturers are able to put the fibre through the various processes in spinning has a great influence on the demand, but it should never be lost sight of that the real consumer is the one who uses the article manufactured. Rope and twine manufacturers may make goods with ease or with difficulty according to the fibre being dealt with, and in each case the article may have a good appearance and sell readily, but it is the user of the goods who proves their real value and gives them the reputation which will ultimately be responsible for increasing or diminishing the demand. It is a well-known fact that binder-twine made from New Zealand good-fair grade (72 to 78 points) cannot be surpassed by binder-twine made from any other fibres in the world, and if our good-fair is found so suitable for this purpose, how much better must be our "fine" grade (80 to 86 points), and how much more likely to earn a higher reputation and increase demand.

Grading Statistics.

The following tables give particulars of the grading during the year ended 31st March, 1921, the Dominion totals and percentages for the previous year being also shown for comparison in the first three tables :—

Hemp (Bales).

Grading-ports.	Superior.	Fine.	Good-fair.	High-fair.	Low-fair.	Common.	Rejected.	Condemned.	Total.
Auckland	..	12	2,653	6,665	5,476	455	42	..	15,303
Foxton	..	..	2,431	14,084	4,625	259	174	..	21,573
Wellington	..	1	5,052	19,403	8,073	1,040	324	4	33,897
Wairoa (Hawke's Bay)	..	..	3,007	33	..	..	..	..	3,040
Blenheim	..	33	800	332	46	4	..	..	1,295
Picton	83	464	242	..	..	..	..	..	789
Dunedin	..	..	545	841	196	11	..	..	1,593
Bluff	..	..	1,861	2,448	703	11	..	..	5,023
Lyttelton	..	15	161	147	..	..	..	..	323
Totals, 1920–21 ..	83	525	16,832	43,953	19,119	1,780	540	4	82,836
Percentage ..	0·1	0·63	20·32	53·06	23·08	2·14	0·60	0·004	..
Totals, 1919–20 ..	..	800	16,228	48,345	23,102	2,057	336	..	90,868
Percentage ..	..	0·88	17·82	53·23	25·43	2·26	0·37	..	..

Total decrease in 1920–21, 8,032 bales.

Tow (Bales).

Grading-ports.	First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
Auckland	177	1,388	484	17	2,066
Foxton	1,110	3,287	277	2	4,676
Wellington	3,480	3,828	312	46	7,666
Bluff	..	1,231	57	11	1,299
Dunedin	..	221	3	..	224
Blenheim	208	157	2	..	367
Picton	264	8	..	..	272
Wairoa (Hawke's Bay)	424	..	..	..	424
Lyttelton	..	625	..	..	625
Totals, 1920–21	5,663	10,745	1,135	76	17,619
Percentage	32·14	60·98	6·15	0·43	..
Totals, 1919–20	6,960	11,194	1,533	71	19,758
Percentage	35·50	57·50	7·50	0·35	..

Total decrease in 1920–21, 2,139 bales.

Stripper-slips (Bales).

Grading-ports.	First Grade.	Second Grade.	Condemned.	Total.
Wellington	197	1,731	..	1,928
Foxton	..	91	..	91
Bluff	..	9	4	13
Totals, 1920–21	197	1,831	4	2,032
Totals, 1919–20	..	132	..	132

Increase in 1920–21, 1,900 bales.

Percentages of the various Grades of Hemp at each Grading-port.

Grading-ports.	Superior.	Fine.	Good-fair.	High-fair.	Low-fair.	Common.	Rejected.	Condemned.
Auckland	..	0·07	17·30	43·50	35·70	3·00	0·22	..
Foxton	..	..	11·26	65·28	21·43	1·21	0·80	..
Wellington	..	..	14·90	57·30	23·80	3·10	0·90	..
Dunedin and Bluff	..	..	36·38	49·73	13·60	0·33	..	..
Wairoa (Hawke's Bay) ..	..	..	98·92	1·08	..	..	..	..
Blenheim	..	2·54	67·90	25·60	3·50	..	..	..
Picton	10·52	58·80	30·70	..	..	..	..	..
Lyttelton	..	4·50	50·00	45·50	..	..	..	..

Percentages of the various Grades of Tow at each Grading-port.

Grading-ports.	First Grade.	Second Grade.	Third Grade.	Condemned.
Auckland	8·50	67·10	23·40	0·80
Foxton	23·70	70·34	5·90	0·02
Wellington	45·30	50·00	4·97	0·60
Wairoa (Hawke's Bay) ..	100·00	..	..	..
Lyttelton	..	100·00	..	..
Picton	97·00	3·00	..	..
Blenheim	56·70	42·70	0·60	..
Bluff and Dunedin	..	95·50	3·70	0·70

GRAIN-GRADING SERVICE.

REPORT OF THE CHIEF GRAIN-GRADER.

The Director-General. Christchurch, 18th May, 1921.

Herewith please find my annual report for the year ended 31st March, 1921.

A. W. Smith, Chief Grain-grader.

During the year I have continued to carry out the duties of Assistant Wheat Controller, but nevertheless have given attention to general grading matters whenever I could spare time from the Wheat Office. I have not, however, given as much time to the grading of oats, chaff, and potatoes as I have to that arising from the sampling of wheat. Those grain-graders holding licenses to issue Government certificates have been made Graders under the Wheat Trade Regulations, and in connection therewith have been carrying out their duties more under my direct supervision than they do when sampling as graders under the terms of the Grain-merchants' Federation.

Coastal and Export Grading.—I would again bring under your notice the suggestion for the withdrawal of Government certificates for coastal shipments, and confining these to export trade only. I doubt, however, in view of the circumstances arising in connection with the purchase by the Government of surplus milling-wheat not taken over by millers, and the necessity for myself as Chief Grain-grader keeping in touch with the Graders in order to see that inferior wheat is not

unloaded on the Government, whether I would be in a position to give the time required to this matter until the wheat-control ceases. Indications point to a very large area of wheat being sown this next season, and if the yield is up to the average it is more than likely that the country will have an exportable surplus. In this event it would be a favourable opportunity to try out a system of grading for outside markets. As the benefits of export grading became apparent the system might be extended in such a manner as would give satisfaction to merchants doing an inter-Island trade and at the same time leave the grading directly under Government control.

Australian Wheat.—Since my last annual report there has been landed in New Zealand close on two million bushels of the Dominion's purchase from the Australian Wheat Board, and the whole of this quantity has passed under my direct supervision. I checked the quality of all shipments, and found them to be well up to sample on which the Australian Government sold. This wheat was all disposed of to millers, the bulk of it going to the North Island mills. The deliberate cutting of bags for stowage purposes was not so pronounced as in previous years. The lodging of claims with the shipping company for this damage evidently had the desired effect of compelling the latter to exercise a little more supervision when the wheat was being loaded. The last million bushels of the four-million-bushels contract was much superior in quality to the sample on which the line was purchased. The Imperial bushel weight of the purchase sample was 60½ lb., whereas the last million bushels averaged 62 lb. to 63 lb. per bushel.

New Zealand Grain-merchants' Federation.—During the year I brought under your notice the fact that the Government grade certificates are now subject to appeal, and this organization reserves to itself the right to override the Grader's decision. There is no mention of any appeal to the Chief Grain-grader, and this further shows that the federation considers itself quite capable of dealing with its own grading matters, which I have no hesitation in asking you to allow it to do.

Potatoes.—This line has caused the most trouble. No alteration in the description of grades has been made since 1918. Those of that year allow for a certain percentage of diseased and rotten tubers—namely, 5 per cent. for good table and 10 per cent. for F.A.Q. grade. When the average duration of a trip between Oamaru, Timaru, and Lyttelton to Auckland was about seven days, potatoes put on board equal to the description set out in the list of grades could be landed at Auckland showing just about the same degree of disease as existed at time of grading. Latterly, however, it has not been uncommon for a boat to be from five to six weeks on the same journey, with the result that potatoes partially diseased are in a much worse state when landed, and the Grader naturally comes in for abuse in connection with the shipments and is often accused of wilfully passing undergrade produce. Another aspect of a long voyage which bears on the question as to whether goods accompanied by a Grader's certificate will be accepted or not lies in the fact that the fluctuation in values is naturally wider over a period of six weeks than in one of say, ten days, and merchants who have shipped potatoes when the market allowed a profit on the transaction have often to face a loss when the goods reach their destination, hence a tendency to endeavour to evade such contracts by appealing against the Grader's certificate.

Work at the Ports.—Detailed reports on the work and conditions at the ports where Graders are stationed—namely, Lyttelton, Timaru, Oamaru, Dunedin, Invercargill, and Bluff—have been duly furnished to you.

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