

1920.

NEW ZEALAND.

DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT FOR 1919-20.

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

SIR,—

Department of Agriculture, Wellington, 23rd July, 1920.

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 Administrator of the Government of New Zealand.

REPORT OF THE MINISTER OF AGRICULTURE.

THE country is now well into the post-war period of reconstruction—the placing of the national house in order and the further development of our resources. The agricultural and pastoral industries must necessarily be the mainstay of the Dominion in meeting its heavy liabilities, and their efficiency and betterment are essential for the increased production demanded by the situation. Never before has co-ordination of effort among all concerned, to formulate and work out sound measures, been so necessary as at the present time.

We have a splendid field to work on for primary production. Large parts of even the long-settled districts are very much underdeveloped, while in the newer country an immense amount of “cleaning up” could be profitably carried out before further virgin areas are tackled. At the same time there are immense waste or semi-waste areas which are capable of being handled for development purposes, and extensive tracts of depleted country capable of regeneration.

Some of the best farming in the world may be seen in New Zealand, but the general average standard could be considerably improved. This is not necessarily due to lack of knowledge on the part of the farmer; it is largely owing to insufficiency of working resources, man-power, and machine-power. It should be the constant care of the State to aid the man on the land to command these resources. Immigration of farm workers is now being actively promoted, while the various hydro-electric-power undertakings in hand will in due course afford the working farmer relief in many ways. Combined with more widely diffused agricultural instruction, better farming methods, and an extended system of rural credit, these factors cannot fail to largely increase production.

The year under review has by no means been uniformly favourable for agriculture in general as regards climatic conditions. A fairly open winter was followed by an unseasonable spring and early summer, temperatures being abnormally low. During the same period a long spell of dry weather was experienced over extensive areas, mainly in the eastern and far northern districts of the North Island. After the New Year a succession of widespread genial rains reversed the position in most parts, and the late summer and autumn have been very favourable for pastures and crops. One exception was the southern part of the South Island, which experienced an unusually dry summer and early autumn, but has since been relieved by ample rainfall.

The weather conditions naturally have been reflected in the crop results as between various districts—differences in the root crops, for instance, being very marked. A noteworthy feature, however, has been the exceptionally high average per acre yield of wheat in the principal grain-growing districts, which may, indeed, constitute a Dominion record when the final returns are available. The average yield of oats is also good. Another feature is the very heavy potato crop in the South Island. Owing to the Australian embargo on the importation of New Zealand potatoes, difficulty has arisen regarding the disposal of the surplus. Apart from such measures as stimulating consumption by better distribution, especially in the North Island, the time appears to have arrived when to meet such emergencies the Dominion should be technically equipped for the manufacture of potato-flour, and for that of commercial alcohol from potatoes or other suitable crops.

The reasons, both national and economic, for New Zealand maintaining its wheat-production at least sufficiently to supply local requirements have been further strengthened by the recent course of events. Australia has demonstrated its unreliability as a source of supply, and shipping facilities in these waters have failed to keep up with the demand for tonnage, while the outside world price of wheat has risen to a level almost prohibitive judged on the standards of this country. A total area of some 300,000 acres of wheat at a normal average yield is sufficient for the Dominion's present consumption, and with reasonable encouragement this acreage can be readily grown. Reports indicate that the area sown and to be sown in wheat for the ensuing season's crop in Canterbury and North Otago will show a substantial increase on last season's acreage. With the increased minimum prices guaranteed by the Government for the crop a reasonable return should be secured by growers, given fair seasonal conditions.

Our sugar-supply is affected by economic conditions somewhat similar to those affecting wheat, and the time seems ripe for definitely taking in hand the production of beet-sugar in New Zealand. A sound start in this industry is all that is required at present, and if the anticipated success is obtained there is no reason why the dependence of the Dominion upon imported cane-sugar should not be gradually minimized. Actual tests have amply demonstrated the suitability of our lands and climate for growing beets of high sugar-content.

Turning to the live-stock position, it is satisfactory to note a gradual but steady increase in the Dominion's dairy cattle. It is true that the present lines of development of the dairy industry, leading to heavy slaughterings of newly dropped calves, is somewhat menacing in relation to the future reinforcement of the country's herds as a whole. There are indications, however, that dairy-farmers are beginning to realize the position, adopting more conservative measures and better calf-rearing methods. The returns of compulsory inoculation of calves for blackleg bear out this view, the last year's figures showing that the great decline in numbers previously recorded had been arrested in the Auckland District, and that the reduction in Taranaki had substantially diminished. The sheep situation gives cause for careful thought. A record level for the flocks in point of number was reached in 1918. In 1919 a fairly heavy decrease was shown. The present year's returns, although the final figures are not yet available, indicate a further decrease of well over a million. Causes for the downward movement can be specified, but this does not materially improve matters. The estimated number of ewes bred from in 1919 was less by several hundred thousand, while the average percentage of lambing also fell, these two factors accounting for a decreased crop of lambs amounting to one million compared with the previous year, and about one million and three-quarters as against the record of 1917. In addition, the killings at the meat-works and other slaughterhouses during the 1919-20 yearly period constituted a record, thus further affecting the returns. In view of the extremely important position occupied by sheep in the development of new country—apart from the direct production of wealth in wool and meat—a backward movement in our sheep stock is economically unsatisfactory. The demand for breeding-stock and resulting hardening of values therefor which may be anticipated should soon right the matter, but some corresponding shrinkage in the meat-export trade will probably be felt meanwhile. Another reduction in swine has to be noted. There are indications, however, that the campaign for more pig-raising on lines to meet present-day conditions in regard to foods is bearing fruit, and that an upward movement may be expected shortly.

The branches of agriculture responsible for our main primary products—meat, wool, and dairy-produce—have continued to enjoy prosperity under the system of Imperial Government purchase contracts, which were renewed for a further year. The wool-clip, however, was somewhat deficient in weight and quality as compared with that of the previous season, with a consequent lower aggregate return to the growers. In the dairy industry the expansion of cheese-manufacture has continued, over 60,000 tons having been dealt with at the grading-ports during the official year. New Zealand, in fact, has become one of the principal cheese producing and exporting countries of the world. The industry is now well equipped in general with cool storage for cheese at the various ports (largely a fortunate legacy from the war conditions), which will affect the trade very beneficially in respect to quality and saving of shrinkage. As was to be expected, butter-production shows a decrease, the raw material being not only increasingly absorbed by the cheese branch of the industry,

but also by the expanding manufacture of dried milk. Present developments of the latter business, however, are mainly for the production of skim-milk powder combined with buttermaking. Greater production of butter is also being stimulated by the rising world-market conditions and prices for that product. In considering the Dominion's production of butter, the fact should be kept in mind that our domestic consumption of this food is very heavy, amounting to about a third of the total output. As regards the lesser branches of the dairy industry, the manufacture of casein has shown a further increase, and condensed-milk manufacture is prospering, but the market for sugar of milk has been depressed.

The position created by the termination of the Imperial purchase contracts for meat and wool, and the resumption of open-market conditions after some five years of controlled and protected business, demands careful handling. The Government has drawn up plans to meet any emergencies of finance, &c., and has the advice of an able committee appointed in connection with the recent conference of producers and related interests. There is good reason to anticipate that the Imperial Government will agree to provide shipping-space for privately owned meat in conjunction with its own stocks. It is estimated that not more, and possibly less, than three million carcasses will be in store in New Zealand when the new season opens, while prospects for a good supply of tonnage to lift meat and other export products are satisfactory. The marketing of a quantity of lamb in America on behalf of the Imperial Government has already done a great deal towards relieving the prevailing congestion of stocks here and consequentially in Britain, and the American market bids fair to become a useful one. London advices indicate a general improvement in the position as regards reducing the great accumulations of mutton, and it is hoped that market conditions will be back to normal before the new season's shipments from New Zealand arrive heavily. It must be realized that 1919 created a record in the total volume of meat exported from the Dominion in any one year, and given satisfactory clearances of storage in Britain, *plus* the forecasted substantial additions to the fleets of the shipping companies in this trade, even better should be done in 1920-21. These companies, it may be noted, expect next year to have refrigerated tonnage capable of transporting ten million carcasses in a twelvemonth, after allowing for dairy-produce.

The fruitgrowing industry has been favoured with heavy crops during the past season. After a closing of export outlets for several years owing to shortage of shipping-space, overseas shipments on a moderate scale have been made to the United Kingdom. Next year it is intended to largely increase exports, including a resumption, if possible, of the South American trade. The local market, however, must remain the first consideration, and the Department is co-operating with the growers' central organization in endeavouring to bring about a better system of marketing and distribution within the Dominion. Poultry-keeping is steadily gaining in strength as an organized industry. It has been handicapped by the prevailing shortage and high price of foods—wheat in particular—but commercial poultry-keepers who secured fair supplies have made handsome returns, owing to the high average values ruling for eggs. The beekeeping industry has had a good measure of prosperity, and continues to expand in spite of certain difficulties of its own. Exports of honey showed a substantial increase.

A further decrease in output has to be recorded in regard to the flax-milling (phormium) industry, this being ascribed mainly to prices falling to unprofitable levels, except in the case of exceptionally well-situated mills, combined with the increased cost of production. The market, however, improved towards the end of the year. It is satisfactory to note that on the gradings quality showed an appreciable all-round improvement. Another good feature was the much greater margin in values as between the different grades, this being the best incentive to millers to raise the quality of their fibre. Improved steam communication recently established with the Atlantic seaboard of North America should prove of much assistance in the marketing of the output.

The supply of artificial fertilizers for the Dominion's agriculture, depending as it does very largely on importation, has much exercised the minds of all concerned during the last two or three years, shrinkage of supplies being accompanied by steadily rising prices. During the twelvemonth under review the supply of phosphates (the most essential fertilizer for this country) received from overseas showed a considerable improvement, with the important exception of superphosphate. Competition for supplies of Australian bonedust and other classes of manure, it may be noted, is being increasingly felt from Eastern Asiatic countries. The Peace Treaty arrangement regarding Nauru and Ocean Islands has now assured our position as regards phosphates for many years to come, and it is hoped that supplies will be coming to hand shortly. Arrangements for the treatment and distribution of the phosphate are well in hand, the business involving considerable industrial development within the Dominion. The potash famine due to the war is now being relieved by supplies of Alsatian as well as German material. The Alsatian deposits have been proved to be of great volume and richness, and should be well developed under the French regime.

The Board of Agriculture has rendered valuable service during the year. Various important matters bearing on the agricultural and pastoral industries were referred to the Board, and the recommendations made by it have been on sound lines and of material aid in dealing with the questions involved. I desire to express my hearty thanks to the Chairman of the Board and his colleagues for their work. The annual report of the Board is printed as a separate document.

The matter of co-ordination with other Departments of State in matters where their activities touch those of the Department of Agriculture—particularly as regards the Education Department—has been well advanced during the year. Conferences held between those responsible should result in still closer touch being maintained in the future. The question of higher agricultural education is receiving careful attention, one of the central objectives being the early establishment of a fully equipped State agricultural college for the Dominion, together with other institutions for training lads specially in the practical work of the farm.

In regard to this Department itself, the various services have worked smoothly during the first complete year under the reorganization effected in 1918, although the scheme remains to be completed in certain directions. The strength on the more strictly scientific side, and in fully trained agricultural instructors, is not yet up to requirements. In considerations of staff it has to be realized that although our population is relatively small we have a country to deal with almost as large as the British Isles. The volume of work connected with a soil-survey, for instance, relates almost entirely to area, not to population.

I would conclude this brief review with an expression of appreciation of the year's work carried out by the staff of the Department in its various branches. With a continuance of high conceptions and faithful execution of duty the future must be fruitful of great result.

W. NOSWORTHY, Minister of Agriculture.

REPORT OF THE DIRECTOR-GENERAL OF AGRICULTURE.

The Hon. Minister of Agriculture.

Wellington, 15th July, 1920.

I beg to submit the following report of the work of the Department during the year ended 31st March last:—

The period has been marked by a further development of the operations of the Department in meeting the growing requirements for the expansion and the improvement of the pastoral and agricultural industries in their various branches. The scheme of re-organization adopted in 1918 and gradually brought into operation is proving satisfactory in working, thanks to the good spirit shown by all concerned. One of the most important features of the scheme lay in the amalgamation of rabbit and noxious-weed inspection with stock-inspection, together with a system of district control. The large division thus constituted is doing good work in carrying out its onerous and, at times, difficult duties.

That branch of the Department's service dealing with agricultural experimental and demonstrational work (both on State farms and smaller areas), and with agricultural instruction and general advice to agriculturists, has shown marked development, one feature being the appointment of three trained instructors, who, together with the capable and reliable officers already engaged in this work, now form a nucleus from which an instructional service capable of supplying the needs of the Dominion should quickly develop, provided the necessary supply of suitable men can be secured. At the present time the agricultural instructional staff is located with headquarters at Auckland, Wellington, Wanganui, Christchurch, Dunedin, and Hokitika respectively, the officer stationed at Wellington having Nelson and Marlborough included in his district. Associated with three of the principal Instructors are student assistants who are going through a university course in agriculture, and who will in due course become available for instructional work in the Department after their university studies have been completed. Meanwhile they act as assistants to the Instructors in their spare time. In the work of agricultural instruction cordial co-operation has existed between this Department and the Education Department, thus enabling better results to be attained than might otherwise have been the case.

As regards the larger experimental farms, particularly Weraroa and Moumahaki, some change in the methods of working has been adopted, with a result that though more expenditure has been incurred in the purchase of stock, the receipts have practically counterbalanced the outlay. Weraroa, as a matter of fact, would have shown a useful surplus were it not that very considerable expenditure has been incurred in improvements, particularly in fencing. Ruakura has still further developed its educational activities, and necessarily suffered in its immediate revenue-earning capacity. At the same time the educational work done there must be admitted to be of great value to the Dominion. On the smaller farm areas the special feature of the work has been the application of scientific knowledge to practical farming-work, and the demonstrational results attained have, it is trusted, been of value to the farmers in the districts surrounding each area.

There is a persistent demand for the establishment of more State experimental farms, but this requires to be met cautiously. It is undoubtedly necessary to do what is possible to meet the very evident desire of the agricultural and pastoral community for more information and more advice on matters bearing on the further development of these industries and on the increase of production, but this can be done without unduly multiplying Government farms. A commencement is being made with the demonstration farm arranged to be established in the West Coast District of the South Island. The possibilities of this portion of the Dominion for dairying, and from a pastoral point of view generally, are very considerable, and the establishment of a demonstration farm there should prove of practical value to the district and, indirectly, to the country as a whole. Special consideration is also being given to the question of a farm for the southern portion of the South Island.

The Department has co-operated with the Repatriation Board in controlling the farming operations of that Department's training-farms at Tauherenikau (Wairarapa) and Avonhead (Christchurch). Arrangements have also now been made with the Defence Department to take over the control of its farms at the Pukeora and Hammer Sanatoria. The necessary finances are provided by the Repatriation Board and Defence Department respectively. Mention must also be made of the Wairarapa Training-farm, near Masterton. This consists of 730 acres vested in the Government by a body of Wairarapa settlers, who also provided the live-stock necessary. It is managed by a local committee, two of whom are nominated by the Government, while a departmental officer is an additional member. This farm is at present utilized for training returned soldiers in farming, and is being rapidly developed on sound lines.

The first complete official year of the Live-stock Division under the scheme of reorganization has shown satisfactory results, and the efficiency of the service should be still more marked during the current year. The already wide scope of the Division has been extended on two special lines—those of pig-raising and wool-handling—by the appointment of an Instructor in Swine Husbandry and a Wool Instructor. It is confidently hoped that the very practical work now being undertaken by the former officer will go far towards arresting the decline in our pig stock, and stimulate this important branch of farming. The work of the Wool Instructor, both directly and by tending to co-ordinate with local technical instruction on the same subject, should also help towards increasing the returns of our smaller wool-growers.

In connection with the health of live-stock—which continues on a generally high level as regards serious disease—it is satisfactory to note that condemnations for tuberculosis in cattle inspected on slaughter again show some reduction. Measures for the control of cattle-tick in the North Auckland districts are well in hand. During the year regulations under the Stock Act were issued, giving the Department comprehensive powers to deal with the position. In order to cause as little dislocation as possible and enable farmers to adapt their practice, the regulations have been brought into force gradually. It is, however, hoped to apply the control system in its entirety during the coming year. The erection of cattle-dips in the affected districts is proceeding, with the assistance of the Department. The entire absence of tick fever in the Dominion may again be noted.

The rabbit pest, which had got ahead in many districts during the war years, has had very active attention in the period under review. The co-operation of the great majority of landholders is well demonstrated by the largely increased sales of phosphorized pollard and other rabbit poison from the Department's depots. The amending Rabbit Nuisance Act of 1918 has proved to have been quite necessary, however, and every care is taken in its administration. It is unfortunate that rabbit-netting remains very scarce and at an almost prohibitive price. The general position of control was rendered very much more difficult by the extraordinarily high market values ruling for rabbit-skins during the year, affording a strong incentive to rabbit-farming in some districts. It is satisfactory to note that on the whole station-holders and farmers generally have done good work in the control of rabbits, and it is obvious that, given a still further development of co-operation between the settlers and the Department, the rabbit pest is capable of being got thoroughly well in hand throughout the Dominion.

The control of noxious weeds presents many difficulties, and in view of this it must be admitted that excellent work has been done by the divisional officers. An amending Bill has been drafted with a view of enabling the work of control to be carried out more satisfactorily and with less openings for the raising of difficulties between departmental officers and settlers. It is hoped that this measure may be introduced during the coming session. The Bill includes provision for making blackberry the only weed of general application in the compulsory schedule, and giving local authorities the option of declaring other weeds as being within this schedule for the purposes of the administration of the Act within their districts.

The meat-inspection services of the Live-stock Division have been well and efficiently maintained. The termination of the Imperial purchase of meat and the resumption of open trading will make further calls upon the energy and efficiency of the officers engaged in this branch of the service. The inspection of dairies supplying cities and towns has been carried out satisfactorily. The inspection of live-stock for disease has continued on the same lines as heretofore, and the activity shown by the officers engaged in this work is indicated by the number of diseased animals which have been condemned and destroyed, thus removing sources of danger for the spread of infection to other animals.

The inspection of manure-sterilizing in Australia and India has made less call on the Inspectors than in previous years, owing to the much smaller quantity of bonedust brought into the Dominion. Good work, however, has been done by detecting and preventing attempts to evade the regulations by shipping to the Dominion animal-manures which have not undergone the sterilizing process necessary to prevent the risk of introduction of dangerous disease.

At the Wallaceville Laboratory a considerable volume of work has been done. It is intended to extend the scope of the investigation work at this institution.

The branch of the Live-stock Division dealing with poultry continues to do very efficient work. The demand for the services of the Inspectors is in excess of their capacity to keep pace with it, and increase in the instructional staff is desirable. As regards demonstrational and experimental work, the position of the Department's poultry-station at Milton requires consideration, the class of soil on which it has been established being really not suitable for poultry-farming, while the plant is becoming out of date. The question of whether the existing buildings on the present site shall be renovated or replaced by up-to-date structures, or whether a more suitable area, preferably in the same district, shall be acquired, is under consideration.

The Dairy Division has handled a big year's work with success, well maintaining also the close touch and friendly relations with the industry which have long obtained in this branch of the Department's service. The capability of the Division to give the industry a sound economic lead as regards up-to-date developments in the manufacture of milk-products, more especially with reference to milk-powder, was much enhanced by the visit of investigation made by Mr. W. Dempster to America and Europe. The value and helpfulness of this officer's report, published by the Department, has been widely acknowledged in the industry. The investigation has thrown much-needed

light on various phases of the production and marketing of sugar of milk, condensed milk, and casein, as well as on the dried-milk question. The effect on the latter business has been steady, but not discouraging.

Progress may be recorded in the work done on farms in connection with the raw material supplied to the dairy factories. Twelve Instructors appointed under the special arrangement with dairy companies as to payment of salaries were at work at the close of the period under review, with other appointments pending. The position, however, still calls for strong handling and further instructional action.

In view of the great importance of increasing the returns from high-priced dairying-lands it is satisfactory to note that the Department's propaganda work in the herd-testing movement is bearing good fruit. The system has shown a greater extension than in any previous period. During the year the Dairy Division had under its direct control twenty-seven associations, comprising 10,460 cows (an increase of over 200 per cent. in each case), while independently operated associations were estimated to be testing 14,744 cows. The "C.O.R." testing of purebred dairy cows, controlled by the Division, also shows a record number of certificates issued, and the beneficial influence of the system on the breeding of our dairy herds in general cannot fail to be more and more felt.

In connection with the grading of butter and cheese at the shipping-ports, a useful feature, apart from the routine work, has been that of gatherings of factory-managers at the grading-stores for educational and informational purposes in conjunction with the official Graders. This is found to be a valuable plan for promoting a knowledge of requirements in quality and uniformity, besides keeping the Division in better touch with the working heads of the factories. Among the dairy companies themselves the system of cream-grading was further developed, and several useful conferences have been held to promote the movement. The results on the quality of butter manufactured from home-separated cream are already very marked.

The varied activities comprised within the function of the Horticulture Division have given all concerned a very busy year. A leading feature of the work was that centring round organization of the fruitgrowing industry in its various phases. In dealing with this subject the Division was much strengthened by the visit paid by Mr. J. A. Campbell, Assistant Director, to the United States and Canada for the purpose of acquiring the latest information in all branches of the fruitgrowing industry, more especially in connection with standardization and marketing of output, together with the co-operative system. A basis for control of our fruit trade, both export and local, has been afforded by the issue of regulations providing for grading, marketing, &c.

The cool storage of fruit is receiving special attention, and the Division is carrying out a valuable series of experiments comprising all stages from the picking of the fruit onward. The State's financial interest in this branch of the industry is now becoming comparatively large, the advances under the Fruit-preserving Industry Act amounting at the close of the year to £84,500, the larger part of which has been utilized for the provision of cool storage.

The Division has had a heavy call made on its resources by the outbreak of the serious disease known as "fire-blight" in orchards over a wide area of the Auckland Provincial District. In order to cope with the position a special force had to be organized under the supervision of Orchard Instructors, and energetic and thorough work is being done in fighting the disease, which, so far as is known, has made its first appearance in New Zealand.

Arrangements were made for shipping a certain quantity of fruit (principally apples) to London this season, and the result of the shipments must, under the circumstances, be looked upon as satisfactory. The Government guaranteed a minimum return to growers, and apparently it will not be necessary to give effect to this, as the returns from the sales should be sufficient to render the payment of the guarantee unnecessary.

A busy year's work has been carried out by the apiary branch of the Horticulture Division in instruction, inspection, and honey-grading. The Tauranga Apiary is now well established, and queen-rearing and experimental work has progressed both there and at Ruakura.

The most important work of the Chemistry Section has been that dealing with soil-investigation, fertilizers, and lime and liming. Good progress has been made in these allied matters, although limitations of staff, equipment, and other resources still impose restrictions on work which is capable of very great expansion, and which, under existing conditions, has to be spread over a longer period than could be desired. The analysis of type soils of various districts has been carried out during the year, together with two or three abnormal classes of soil. The agricultural economic side of the survey is being kept well to the front in this work. In regard to Canterbury, an arrangement has been arrived at with the Lincoln College authorities with the object of avoiding overlapping, as the College is undertaking a soil-investigation of several districts.

It has become fairly evident that if the Dominion is not to fall behind other agriculturally advanced countries our fertilizers law will have to be amended and strengthened in several directions. The shortage and high price of standard fertilizers experienced for some time past has had the effect of bringing on to the market new low-grade proprietary mixtures, also certain phosphates of doubtful effectiveness.

In regard to the development of limestone resources, an official committee was formed during the year, consisting of this Department's Chemist, the Director of the Geological Survey, and the Assistant Chief Engineer of the Public Works Department. The main object is to better co-ordinate the information and advice placed at the disposal of bodies of farmers and others undertaking the supply of limestone and lime in the various districts. Legislation laying down compulsory standards of quality in connection with the sale of agricultural lime or ground limestone, with the idea of protecting consumers, has been suggested. Owing, however, to the extremely variable nature of the deposits and the variation in plant for handling the raw material, it is not improbable that such restrictions would largely defeat their object by involving a material increase in cost to the consumer. It would be feasible, however, to make provision for vendors to sell optionally under guarantee of purity.

Consideration of the important matter of the efficiency of sheep-dips in connection with proposals for some system of registration of these compounds has brought out a suggestion that the object sought would be best attained by comprehensive legislation, on the lines of the United States Insecticide Act, covering all such preparations, including orchard sprays. This idea is certainly worthy of favourable consideration.

Work of much value to the Dominion's agricultural industry continues to be carried out by the Biology Section. The ecological study of our grasslands is doing a great deal towards their improvement—a matter of first importance. In plant-pathology the main work has been on "dry-rot" in swedes, "take-all" in wheat, and "yellow-leaf" of phormium, while the Section has also taken a useful part in investigations connected with the fire-blight campaign. In economic entomology a good deal of original work has been carried out. Forest insect pests, and particularly those affecting eucalyptus plantations in the South Island, have been given some study.

During half the year the Biologist, Mr. A. H. Cockayne, was absent on a visit to the United States. His time in that country was mainly devoted to a study of agronomical conditions and research, seed-testing methods, and agricultural education, including the university extension system. The widened first-hand knowledge and experience acquired from this overseas travel should prove of much value in the development of the Department's work. An adaptation of American practice as regards standards of real value—definite percentages of purity and germination—for imported seeds has been embodied in a Pure Seeds Bill which has been prepared for submission to Parliament during the current session. The efficiency of our excellent seed-testing system can also be strengthened in several directions, especially with regard to more careful sampling by seed-merchants and others sending in samples for test.

The volume of work connected with flax-grading has fallen off somewhat as a result of decreased output consequent upon market and shipping conditions. The quality of the product shows improvement, good-fair grade, which may be regarded as the standard, showing a substantially increased percentage of the total gradings. More care in manufacturing, especially in the scutching process, is required, however, in some of the mills.

Owing to the urgent requirements of the Board of Trade in connection with the purchase of wheat the services of the Chief Grain Grader were loaned to the Board during the greater portion of the year. In view of the necessity for keeping abreast of the times it is intended, as soon as opportunity permits, to review the whole system of grain-grading as at present in operation, with a view to effecting improvements in the direction of greater efficiency.

The publications work of the Department has been well maintained, the circulation of the *Journal of Agriculture* having continued to increase during the year. Difficulties in connection with the paper-supply, however, have since placed severe restrictions on expansion in this direction, also on certain other publishing activities which had been proposed.

Under legislation passed during the 1919 session of Parliament a separate Department of Industries and Commerce was constituted, and shortly after the New Year the functions of that branch of this (Agriculture) Department were taken over by the new organization. At the same time the Department of Agriculture, Industries, and Commerce became simply the Department of Agriculture. The industries and commerce work carried out by this Department during the first part of the period under review was on similar lines to that outlined in last year's annual report, and does not call for any special comment. As indicated in that report, such work was extraneous to the legitimate functions of a Department of Agriculture, and the change here recorded will enable this Department to devote itself exclusively to its own great field of work.

During the past ten years the Board of Governors of Canterbury Agricultural College, Lincoln, has had in hand experimental work with the object of supplying to farmers improved seed of the commonly grown varieties of wheat. The Department of Agriculture now grants a subsidy to allow of the further prosecution, in conjunction with the Department, of this work and of its extension to the improvement of oats. Last year about 20 acres at Lincoln were under various wheat-selections, with their accompanying check-plots of commercial seed, the latter being used to estimate the superiority (if any) of the selections. Most of the plots were devoted to strains of White-straw Tuscan and Velvet, these being the two varieties in which no markedly improved strains have been isolated by the work of preceding years. There are indications that the trials of the next two years will allow the distribution of a strain of White-straw Tuscan of as good quality as the strains of Hunters, Pearl, Solid-straw Tuscan, and Purple-straw that the College has already produced. A start has been made with the selection of oats, and at present about 5 acres are under strains of Algerian oats on their trial. The improved strains of wheat already produced have been distributed to farmers at ordinary seed prices, and supplies of the pure seed are maintained by the Canterbury Seed-growers' Association, a group of farmers who take steps to keep their crops pure enough for seed purposes, and who submit them to inspection from that point of view. The Department assists the work by paying the travelling-expenses of Dr. F. W. Hilgendorf, of Lincoln College, while inspecting the farmers' crops. Some 2,000 bushels of seed-wheat bearing his certificate of purity were distributed during the past season.

In conclusion, I must express my thanks to the staff of the Department throughout for the energy and activity displayed in carrying on the work. The Assistant Director-General has worked in close co-operation with myself, and proved a most valuable coadjutor. The Divisional Directors, together with the Chemist and the Biologist and other responsible officers, have rendered most reliable and efficient services.

I append detailed reports furnished by each branch of the Department's services.

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

APPENDIX.

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LIVE-STOCK DIVISION.

REPORT OF THE DIVISIONAL DIRECTOR.

The Director-General.

Wellington, 22nd June, 1920.

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 for the past year I may be permitted to say that, while the whole of my anticipations have not been realized, a great amount of very useful work has been accomplished by the Division, the effect of which will be felt in the present year's operations. The organization brought into being towards the close of the previous year has worked smoothly, and by the exercise of district control greater efficiency has been maintained than would otherwise have been possible with the rapidly expanding calls now made on the Division's officers.

The scope of the work of the Division is steadily growing, and during the year it was decided to expand the avenues for conveying advice to those on the land, particularly to new settlers, who mostly comprise returned soldiers, by appointing instructors in wool and swine husbandry respectively. Mr. H. H. Chaplin was appointed to the position of Wool Instructor, but he subsequently resigned, and Mr. J. G. Cook was appointed to the position. Mr. K. W. Gorringer, who has had a large practical experience of swine-breeding and management, was appointed to the position of Instructor in Swine Husbandry, and entered upon his duties last January. He has already done a great amount of useful work, particularly in giving instruction to returned soldiers at the respective farms where they are receiving instruction in farming operations.

Great inconvenience has been experienced by officers of the Division on account of the lack of housing accommodation everywhere, this difficulty being particularly met with in the event of any transfers of married officers becoming necessary. This matter deserves serious consideration at the hands of the Department, and some scheme devised whereby its officers can be housed without the constant worry of not knowing the moment when they may be required to vacate the houses rented by them and without any prospect of obtaining another except under the same conditions. The staff of the Division comprises some three hundred officers, most of whom are married, and the majority of those not yet in that position are most anxious to become so if only they could obtain houses.

To the District Superintendents and Principal District Inspectors at Dunedin, Christchurch, Wellington, and Auckland I have to tender my thanks for loyal and valuable assistance at all times rendered, and for the energy and enthusiasm which they have shown throughout. I have also to convey to all other officers of the Division my thanks for their services during the year, rendered sometimes, I know, under difficult and unencouraging circumstances.

CONDITIONS OF STOCK GENERALLY (SUPERINTENDENTS' DISTRICTS).

Auckland District.—Following a dry autumn the winter of 1919 was entered with pastures very bare generally, a totally inadequate supply of hay and other fodder-crops, and stock, particularly cattle, in rather poor condition. The shortage of feed continued to become more acute as the winter advanced, with the result that by the end of winter the condition of stock generally varied from poor to emaciated, according to the acuteness of the food shortage in different localities. The area which suffered most was that north of Whangarei and Dargaville (usually good winter country), where heavy mortality occurred among cattle, and also, though to a less serious extent, among sheep. Proceeding south from Whangarei and Dargaville the pastures continued to improve, and in the southern part of the province sufficient feed was available to carry the stock through the winter in a satisfactory condition. Good rains were experienced in the early spring, and stock improved rapidly in condition, but this was followed by a very dry summer, which was broken only by passing showers right through to February. Since February welcome rains have been experienced at regular intervals, with the result that pasture and root crops are now in excellent condition, and good takes of autumn-sown grass and oats have been secured. All classes of stock are now in a satisfactory condition, and present indications point to an ample supply of feed being available to carry them through the winter in good order.

Wellington District.—The season's rains have been well distributed over the district, and both grazing and dairying areas have prospects of ample winter feed, with the exception of Hawke's Bay and Gisborne lands, where during the summer the severe drought affected the pastures badly, and though good rains fell about the end of March they unfortunately came too late to provide the necessary growth to carry cattle through the winter months. Sheep, owing to their ability to utilize barer pastures, will not fare so badly. The health and condition of horses has been good. Horse-

breeding generally in this district is not carried out on progressive lines. This is most noticeable in the case of hacks and harness horses. Draught and milk-cart horses are again in good demand at high prices. Good hacks and harness horses are also scarce and prices high. Weedy sorts are fairly plentiful and almost unsaleable. The condition and health of cattle are satisfactory generally and good prices have been maintained, good dairy cows reaching a record price. Throughout the dairying districts a very large percentage of this season's calves have been slaughtered, which will no doubt show its effect on the young-stock markets later on.

Christchurch District. In a considerable portion of this district cattle were in rather low condition at the end of last winter. Those on the West Coast and from Ashburton northwards were in poor condition—in some instances very poor; while those south of Ashburton were in fair condition. This poor condition was specially noticed in regard to dairy cows in two inspection districts, and consequently in these two places the percentage of deaths among cows at and after calving, on account of their low condition, was higher than usual. With this exception the general health and condition of cattle have been good. The estimated percentage of deaths among dairy cattle from all causes during the year varies in different Inspectors' districts from 2 per cent. to 5 per cent. The estimated percentage of calves kept varies from 12 to 90. The percentage of mortality among calves under one year old varies from 4 to 10, the principal causes being parasitic gastritis, improper feeding, and want of shelter. The calves are fed chiefly on skim-milk and whey, while in some cases a little proprietary or other food is added. Several of the Inspectors estimate that the depreciation in value owing to insufficient care and improper feeding under one year old is very large—up to as high as 33 per cent. In a few localities more interest has been taken in the breeding of horses than during the previous three years; but on the whole horse-breeding could not be said to be progressive. There is a great demand now for draught and half-draught horses, and good prices are being paid for them—up to £50 and £60 for ordinary geldings. At one sale in the Lincoln district a two-year-old draught entire colt was sold for 1,000 guineas, which is said to be the Australasian record for a colonial-bred two-year-old colt. The increased demand and prices for horses should have a stimulating effect upon breeding operations. In the majority of instances winter feed, such as roots, hay, straw, lucerne, &c., is provided; but in some cases, especially on the West Coast, very little provision for winter feed is made.

Otago-Southland District.—The season proved to be a rather dry one, particularly in South Otago and Southland, but the condition of stock in general has been good and very little mortality has been reported. At Tuatapere only one special case of malnutrition has been reported. This was in a portion of bush country on the bank of the Waiau River. In the first year after burning and sowing, stock did very well, but in the second year there was a considerable loss, the prominent symptoms being emaciation and in a large number of cases diarrhoea. Treatment was applied with beneficial results, and some of the stock removed to other pastures immediately improved. There was a tendency on the part of the settlers to overstock, and, being a wet season, the forage did not seem to be sufficiently nutritious. During the past season, which has been fairly dry, stock have done very well. Two owners recently sold a line of fat cattle, while the third is milking thirty-five cows and rearing twelve calves, each on an allotment of 130 acres, and, considering the large area covered by stumps and fallen trees, conditions generally are improved and prospects more favourable. The past year has been singularly free from disease among sheep. The season has been good and fairly dry, and several diseases due to excessive feeding and want of exercise have been marked by their absence.

ANIMAL DISEASES.

Blackleg.—The regulations under the Stock Act designed to control the spread of this disease have been administered as heretofore in the areas defined, with quite satisfactory results. No alteration has been necessary in the boundaries of the Taranaki District area, but it will be necessary to review and slightly modify the boundaries of the areas defined in the Auckland District, and this is having attention. The number of calves inoculated had shown a steady decrease in the past few years, owing to the practice of killing the majority of the calves at birth, and it is somewhat satisfactory to notice that the former heavy decreases shown are not so marked this year. The figures of calves inoculated during the last three years ended 31st March are as follows:—

					1918.	1919.	1920.
Auckland	..	..	..	..	106,614	98,881	98,500
Taranaki	..	..	..	..	73,620	53,024	45,667

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

Contagious Mammitis.—This disease continues to give trouble in dairying districts, but would appear to have been less in evidence in the Auckland dairying districts than heretofore. The loss occasioned by its appearance must still, however, be considerable, and every precaution possible to avoid its occurrence requires to be undertaken. Good work has been done by Veterinary officers and Inspectors of Stock by lectures and advice to owners, and a large number of samples of milk are examined at the Veterinary Laboratory to determine the presence or otherwise of the specific organism.

Contagious Abortion.—The position regarding this disease remains much the same, and it is not reported to be more in evidence in any of the districts with the exception of Wellington, where cases are more or less frequently reported. The disease is, however, more amenable to treatment than contagious mammitis, and where the treatment recommended by the Department is carefully followed good results are obtained. Nevertheless the loss must still be great, and more care should be exercised by farmers when introducing new animals to their herds to see that they are isolated and preventive measures taken before allowing them with the existing herd.

Vaginal Catarrh.—A number of cases which on investigation were found to be suffering from vaginal catarrh have been reported, and it is more than probable that a number of the cases of cows constantly returning to the bull are attributable to this trouble.

Tuberculosis.—The examination of all carcasses of animals slaughtered at meat-export slaughter-houses and abattoirs again shows a slight reduction in the percentage found affected with tuberculosis in any degree, as indicated by decreases in the following classes of stock: Cows, 0·07 per cent.; bullocks and heifers, 0·70 per cent.; and swine, 0·98 per cent. Bulls show an increase of 0·13 per cent. on the previous year's figures. While these figures are no doubt satisfactory so far as the examination of slaughtered stock is concerned, the condemnation of cattle in the field by Stock Inspectors does not appear to indicate a corresponding reduction, as the condemnations have increased from 2,914 to 3,261. Some of this increase may be accounted for by a greater degree of activity on the part of the field staff, but after giving the present methods a good trial it would appear that this disease can never be eradicated or even reduced to a minimum by the present method, whilst the demand for increased compensation calls for an early review of the whole position. I am of opinion that if we were to give some inducement to owners to have their animals subjected to the tuberculin test by increasing the amount of compensation payable only for cattle condemned as a result of that test, some permanent good would follow, and I trust that consideration will be given to proposals to more effectively battle with this disease in the future.

Actinomyces.—This disease has again been responsible for a number of condemnations in the field, especially in the Auckland and the Otago-Southland districts, where the proportion of animals condemned is exceptionally high. The condemnations for actinomyces were as follows: Auckland District, 158; Wellington District, 102; Canterbury District, 59; Otago District, 135.

Cattle-tick.—The control of the tick found affecting cattle in the North Auckland district has been taken well in hand. Regulations were gazetted during the year, and although they were not put wholly into operation, owing to dipping facilities not being available in the tick-infested districts, the provisions regarding the removal of stock to clean country were put into operation, and it is hoped to have the regulations fully carried out before next season. The dip erected at Oakleigh (Whangarei) proved quite satisfactory, and, with a few minor alterations to the plan, has been adopted as the standard for erection by local bodies or committees appointed throughout the district. Sites for the erection of dips have been approved in a number of instances, applications for the Government subsidy of pound for pound up to £150 have been granted, and it is anticipated that a number of the dips will soon be erected and ready to receive cattle for dipping.

LIVE-STOCK STATISTICS.

Sheep.—The enumeration of sheep in the Dominion as at 30th April, 1919, showed a decrease of 709,748 when compared with the previous year, but this was not unexpected, as the previous year's increase was partly accounted for by delayed slaughtering owing to the backward season, and the 1918 lambing had shown a material reduction. Last year's figures, however, were still in advance of all previous years' returns with the exception of 1918. 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

The present year's figures are not, at time of writing, compiled, but in the face of the increased slaughterings shown, and the decrease in the estimated lambing-percentage, a reduction on last year's figures must be looked for.

Cattle.—The statistics collected in January, 1919, again show a satisfactory increase over the previous year in both dairy cows and other cattle. The following table shows the numbers of the respective classes:—

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

Swine.—I have again to record a marked reduction in the number of swine in the Dominion as revealed in the last enumeration. The figures for the last five years are as follows: 1911, 348,754; 1916, 297,501; 1917, 283,770; 1918, 258,694; 1919, 235,347.

Consequent on the high prices ruling for bacon, hams, and pork the breeding of pigs is receiving more attention this season than for some few years past, but on account of the utilization of the whole of the by-products of milk through the increase in cheese-factories and the dried-milk industry a new system of feeding becomes imperative before any permanent improvement can be possible. Advice on the growing of suitable forage crops and the system of feeding is being given by the Division.

Horses.—The enumeration of the horses in the Dominion taken in January, 1919, showed a decrease of 10,412 as compared with the previous year, the figures being 363,188 and 373,600 respectively.

SLAUGHTER OF STOCK FOR EXPORT.

The contract with the Imperial Government for the purchase of all meat slaughtered for export remains in force until 30th June, 1920, at the schedule of prices arranged in November, 1916, and a very large quantity of meat still remains in the freezing-chambers, with little prospect of obtaining a clearance before the commencement of the next season's slaughterings. The termination of the contract and the difficulty of finding immediate shipping will necessitate the making of financial arrangements to meet the new position, and these may be expected to mean a marked increase on pre-war charges.

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

			31st March, 1920.	31st March, 1919.	Increase.
Cattle	..	..	256,459	218,871	37,588
Sheep	..	..	4,658,897	3,690,152	968,745
Lambs	..	..	3,139,238	2,845,413	293,825

Several of the freezing companies found it necessary to provide additional cold-storage accommodation during the year. Two new meat-export slaughterhouses are about to be erected, both in the North Island.

INSPECTION OF MEAT.

The inspection of all carcasses slaughtered at meat-export slaughterhouses, abattoirs, and bacon-factories was carried out satisfactorily, and now that all our troops have returned no further difficulty should be experienced in keeping a sufficient staff to undertake this work.

The following are the numbers of each class of stock slaughtered under direct inspection during the year ended 31st March, 1920 :—

Cattle ..	359,173	Sheep ..	5,263,605	Swine ..	115,225
Calves ..	32,069	Lambs ..	3,254,184		

With the exception of swine, which again show a decrease in the number slaughtered, these figures easily constitute a record for any one year, the increases on the corresponding period of last year being as follows : Cattle, 51,357 ; calves, 13,197 ; sheep, 1,093,081 ; lambs, 325,292 (1,418,373 in the combined sheep and lamb slaughterings).

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

			Abattoirs.	Meat-export Slaughterhouses.	Bacon-factories.
Cattle	..	..	102,714	256,459	..
Calves	..	..	22,692	9,377	..
Sheep	..	..	604,708	4,658,897	..
Lambs	..	..	114,946	3,139,238	..
Swine	..	..	53,886	38,043	23,296

At ordinary slaughterhouses the stock killed was as follows : Cattle, 54,033 ; calves, 2,302 ; sheep, 248,877 ; lambs, 26,417 ; swine, 25,520.

In addition, 24,424 carcasses 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.

COMPENSATION PAID FOR STOCK CONDEMNED.

During the year 4,148 head of cattle were condemned and ordered to be destroyed under the provisions of the Stock Act, and compensation to the amount of £15,034 (being at the rate of half the market value as fixed at the time of condemnation) was paid out for the financial year. Compensation paid for animals condemned on inspection at the time of slaughter, under the provisions of the Slaughtering and Inspection Act, amounted to £12,014, making the total compensation paid during the year under the Acts named £27,048, as compared with £22,438 for the previous year.

IMPORTATION OF BREEDING-STOCK.

Shipping difficulties and the high cost involved were undoubtedly again responsible for the numbers of stud stock imported not being greater than they were. The following animals were imported and entered into quarantine as required under the regulations : Two trotting-stallions, five bulls, three rams, and four pigs (three sows and one boar).

INSPECTION OF DAIRIES SUPPLYING MILK TO TOWNS.

The inspection of dairy premises and herds supplying milk for town consumption has been carried out energetically during the year, those supplying milk to the cities and larger towns being necessarily given more frequent visits of inspection to ensure that, as far as possible, the utmost cleanliness is observed and conditions maintained in respect to each of the premises as is compatible with the requirements of a good and clear milk-supply. The scarcity of cement has to some extent hampered the efforts of the Inspectors in connection with the provision of concrete floors and drains, but on the whole the premises are maintained in reasonably good condition and the Department's requirements attended to.

THE WALLACEVILLE LABORATORY.

During the latter period of the war the work at the Wallaceville laboratory necessarily fell off considerably, the only operations being of a more or less routine character. The members of the staff doing duty at the outbreak of the war, all of whom answered the Empire's call, returned to duty during the year. Mr. C. S. M. Hopkirk, Laboratory Assistant, applied for and was granted leave of absence for four years, to enable him to proceed to the Veterinary School of the Melbourne University, for the purpose of qualifying for the degree issued by that institution.

An important feature of the work at the laboratory was the preparation of blackleg vaccine, 180,000 doses being supplied for use by Inspectors. Examination of samples of milk for both contagious mammitis and tubercle bacilli, and of pathological and bacteriological specimens, and some feeding experiments, were undertaken. Other general work of a more or less varied nature was also carried out. It is hoped to go further into the question of contagious mammitis and contagious abortion during the current year, with a view to further enlightenment on these two diseases.

The operations on the laboratory farm have been well carried out by the Farm Overseer during the year, and the experiment with a view to testing the effect of manures applied to pastures in regard to the production of mutton was continued. An account of the results of these experiments up to last year was given in the *Journal* by Mr. B. C. Aston, who is responsible for the scheme.

IMPORTATION OF ANIMAL MANURES.

The importation of animal manures again failed to meet requirements, although the quantity imported was considerably greater than has been the case for some years. The embargo placed on the exports from Australia, and the want of shipping from there and India, were the main factors in the situation. Competitors from the East have also had to be contended with in both India and Australia, and in some cases considerable quantities of bone manure which had actually been prepared under the provisions of the New Zealand regulations for export to New Zealand ultimately found its way to the East. The matter of the embargo by the Commonwealth Government was taken up by the New Zealand Government, and as a result of representations made permits were granted, although in some cases quantities of manure were lost to New Zealand owing to the delay experienced in obtaining the permits not allowing for shipping before the departure of the steamer on which space had been secured.

I append the report of the Inspector of Manure-sterilizing, Sydney, who has carried out his duties with great satisfaction, and has at all times kept the Department well advised of the position in Australia:—

New South Wales was the only State within the Commonwealth whence animal manure was exported to the Dominion during the period under review. Seven mills carried out the preparation and manufacture of animal manure under the requirements of the New Zealand Stock Act, 1908, regulations. The names of the licensees and the location of these works are shown hereunder:—

License No.	Name of Mill.	Licensee.	Location.
1	Metropolitan	M. O'Riordan and Sons	Alexandria, N.S.W.
2	Kitchen and Sons, Limited, No. 1.	Kitchen and Sons, Limited	Alexandria, N.S.W.
3	Excelsior	M. Gearin and Sons	North Botany, N.S.W.
4	Pyramid	Paton, Burns, and Co.	Alexandria, N.S.W.
5	Paragon	R. S. Lamb and Co., Limited	Alexandria, N.S.W.
6	Riverstone Meat-works ..	B. Richards and Sons, Limited	Riverstone, N.S.W.
8	Newcastle Abattoirs ..	Newcastle District Abattoir Board	Newcastle.

NOTE.—The above-mentioned mills, with the exception of Nos. 6 and 8, have already applied for a renewal of license.

The system of inspection has been carried out on the same lines as hitherto followed; little or no difficulty has been experienced in obtaining the full treatment required under the regulations for all animal material intended for export. Regarding the licensed buildings, appliances, and surroundings generally, these I am pleased to be able to report on as satisfactory. The great increase in the cost of production has compelled the proprietors of these mills to install more modern appliances than hitherto used—in the way of artificial-drying machinery, conveyors, and dust-collecting appliances, all of which are beneficial in the further protection of sterilized material from contamination during manufacture.

The recent closing-down of many of the meat-packing works in the vicinity of Sydney has considerably reduced the supply of raw material formerly obtained from this source. A reduction in the quantity of bone refuse from butchers' shops is also being noticed; this is owing to the State Meat Board instituting a new method for the distribution of meat by boning the forequarters of beef at the abattoirs, and supplying the meat direct to the public in a minced form. The bones in this case are treated at the State abattoirs. The supply of dry country bones has of late been greater than usual, no doubt attributable to the effect of the drought, which is still severely felt in a large section of this State.

During the past year the exporters of manure have laboured under many difficulties in the way of numerous strikes, shipping shortage, influenza epidemic, and the Federal embargo against exportation—the latter being found the most grievous. Notwithstanding these handicaps it is gratifying to be able to record that the quantity of animal manure exported to New Zealand was almost three times as much as that sent the previous year. The total quantity for which declarations were countersigned by me was 61,005 bags, weighing 4,628 tons. Of this 4,447 tons was bonedust, 31 tons desiccated blood, and 150 tons blood-and-bone. With the exception of 295 tons this manure was all shipped during the last eight months of the year. Buyers of fertilizers for the East are now competing very strongly here for all classes of manure, and a continuance of this competition will probably cause a great shortness in stocks.

The demand from the Dominion for animal hair this year has been larger than formerly. The only exporters from this State were Messrs. D. Lee and Sons, of Botany, whose works were regularly visited during the preparation of consignments for export. I at all times found the treatment to which the hair was subjected fully in accordance with the demands of the regulations dealing with this article.

I would suggest in the case of consignments of mixed fertilizer described by the shippers as "other than animal manure" as defined by the Stock Act, the desirability of a statutory declaration accompanying the same, setting forth all the ingredients of such manure, and that during its manufacture it was not in contact with any animal material or any other substance or matter likely to convey disease. The package of the same in new bags should, I think, be demanded, as in the case of animal manure.

I wish to place on record my appreciation of the efficient manner in which Mr. Pearson, my assistant at Botany, carried out his duties, and also to express my thanks to Mr. S. T. D. Symonds, M.R.C.V.S., Chief Inspector of Stock, Sydney, and members of his staff, for assistance and advice on many occasions.

SHEEP-DIPPING.

The practices of exposing for sale sheep affected with lice and failing to dip according to the provisions of the Stock Act are still, unfortunately, far too prevalent, and in the interests of the Dominion as a whole this should not be. A number of prosecutions have again had to be instituted for these offences, and heavier penalties will have to be asked for if lice-affected sheep are to be reduced to a minimum. Lice—and ticks too, for that matter—can be kept off sheep. A practical instance of this came before the Department during the year, when a trial of a certain sheep-dip was to be carried out on one of the quarantine stations where a few flock ewes were depastured. To carry out the test sheep affected with ticks had to be introduced from outside, as the ewes were perfectly clean.

MAMAKU FARM (BUSH-SICK AREA).

During the past year good progress has been made at this farm. More land has been acquired, and an early start will be made in the production of suitable crops to enable systematic dairying to be commenced. New sheds are to be erected, and a large area is to be stumped and put under the plough. Financially the farm has been a success, and now with a permanent supply of water assured it is confidently expected that it will continue self-supporting, and that any experiments necessary for the investigation of bush sickness will be covered by the income produced. There are no new developments to report, but a number of observations have been noted which will prove of great value when dairying operations are commenced.

POULTRY.

The high prices that have ruled for poultry-food during the past year, and the inability on the part of many poultry-keepers to secure a sufficient supply of wheat for their birds, have not had a tendency towards the industry regaining its pre-war condition. So acute has been the position that none but the highest type of bird would pay to keep. This has necessarily meant a serious reduction of stock, and consequently a great shortage of fresh eggs. The demand for this article of diet has been far from satisfied, with the result that higher prices have been paid for guaranteed fresh eggs than ever before in the Dominion. Poultrymen who thoroughly understand their business and who severely culled their flocks, retaining only birds of heavy egg-capacity, and who were in a position to secure ample food, report making more money out of their poultry than ever before. Particularly does this apply to those who were in a position to grow their own food—namely, the small settlers on the land. It is from this source that the supply of eggs and table poultry must chiefly come. The great drawback to the industry at the present time is that too many poultry-keepers are solely dependent on the farmer for growing the necessary food-requirements, and whether the industry advances or not largely depends on how far the farmer is prepared to do this. In this connection history has repeated and will again repeat itself—that is to say, when foodstuffs—particularly wheat—are cheap and plentiful, eggs will also be in a similar position, and *vice versa*. Small settlement, whereby the poultry-keeper can grow his own fowl-food, and particularly where the business is conducted as a side-line, appears to be the only prospect of the industry being developed and multiplying in importance.

Milton Poultry-station.—The policy of the Department in supplying purebred poultry and settings of eggs from tested stock at moderate rates from this station has been continued during the past year. The demand was so great, especially from the farming community, that many orders had to be refused and the money returned. None but the best specimens of the breeds have been bred from, and the progeny have had a gratifying effect in raising the standard quality of many poultry flocks of the Dominion. While much good work has been done in this direction, the equipment does not serve as a means of demonstrating the best methods of housing, &c., that should be adopted on a modern plant. The buildings are absolutely out of date, and in many cases are fast getting in a decayed condition. Further, the general layout of the plant is in these more enlightened days anything but what it should be, making it most costly to work. In view of this, and taking into account the unsuitability of the soil for poultry, together with the severe climatic conditions usually experienced at Milton, I am of the opinion that it should be closed, and that a new up-to-date plant should be established in its place in another locality. If this were done the policy of supplying eggs and stock for breeding purposes could be continued, but in addition the plant would serve a dual purpose by demonstrating the right methods of keeping poultry for profit-making. With the present place it is most unsatisfactory, especially seeing that so many returned soldiers have gone and are contemplating going to Milton for the purpose of being given a thorough training in all branches of poultry-work. The stock on the plant is of excellent quality, but it requires constant oversight to maintain the standard under the existing conditions.

Feeding-tests.—During the year two feeding-tests were carried out at the Milton Station—the one to ascertain the cost of rearing pullets to an age of six months, and the other to find out what result in egg-yield could be secured by the elimination of meat or its substitutes from the ration. The results of these tests are being published in the Department's *Journal*.

Poultry Instructors.—Though there are now four Poultry Instructors, it is found impossible to comply with all the many requests for their services to deliver lectures and to visit plants for the purpose of giving practical advice on the spot. The question of increasing the staff of Instructors is a matter for urgent consideration.

Utility-poultry Standards.—In order to place the judging of utility-poultry on a sound and uniform basis the publication of a New Zealand Utility-poultry Standard, with drawings of the various breeds dealt with, was undertaken by the Department, with the valuable assistance of delegates appointed by the different poultry organizations. It is satisfactory to state that the book is now an accomplished fact, and reflects credit on all who gave their assistance to its preparation. The most difficult part of the work lay in the drawings, involving an immense amount of patient working-out of detail on the part of Mr. F. C. Brown, Chief Poultry Instructor, and Mr. C. Cussen, who rendered valuable assistance. Great credit is also due to Mr. G. Nordstrum, of the Government Printing Office, for the manner in which he completed the drawings for the respective plates.

RABBIT NUISANCE.

The administration of the Rabbit Nuisance Act has been carried out energetically during the year, and although the whole of our expectations have not been realized good spade-work has been done, and with favourable conditions a very great improvement should be shown in the near future. Weather conditions have been unfavourable for the suppression of the pest, and although good work was done in the early part of the season the improvement could not be followed and maintained, owing to the continuous wet weather manifesting itself when poisoning operations should have been pushed ahead.

The 1918 amendment to section 2 of the Act has been adversely criticized in some quarters, and strong representations have been made for its withdrawal; but the past year's experience has more than demonstrated the absolute necessity that existed for the strengthening of the Department's hands, and the statements made in support of the agitation have, in my opinion, done more to show this than otherwise. As I mentioned in my last report, the section in question may be said to be drastic, but administered with judgment and fairness, as I am prepared to say it has been, it is no more drastic than other enactments administered by the Department. No prosecution has yet been authorized without corroborative evidence being forthcoming from an independent Inspector or Inspectors of the conditions existing, and each application is reviewed by the Superintendent of the district, and also by myself personally, before being authorized. Advantage has not in the slightest degree been taken of the provision "to the satisfaction of the Inspector" in connection with these prosecutions. The Magistrate is always there to see fair play and that there is no sign of persecution on the part of an Inspector. Prosecutions are not liked by the Inspectors, who would be much happier without them, and are in no more favour with the Department; but, unfortunately, there are some landholders who must be prosecuted or nothing would be done. The complaints voiced during the year have not been from those who are anxious to rid their country of the pest, but from the dilatory owners and others who have an interest in the export of rabbits and their skins. I am thoroughly convinced that any amendment to the Act tending to weaken its present powers will have an effect that would be disastrous, and any progress made would be entirely lost.

The high price to which rabbit-skins soared during the year only tended to aggravate the trouble and was not an unmixed blessing.

I append the reports made by the respective District Superintendents on the rabbit pest in the portions of the Dominion controlled by each:—

Dunedin.—The rabbit nuisance entails an enormous amount of work on the Division. On the whole the year was not a favourable one for suppressing rabbits. Early and excessive breeding occurred owing to a mild winter and early spring, while the continuous wet season later interfered considerably with the work of destruction, and this, together with the extra insincerity of many landowners, has caused the increase of the rabbit pest to an alarming extent. No doubt the high price ruling for skins last year was a further incentive to many dilatory and short-sighted property-owners to save rabbits as much as possible in anticipation of receiving substantial remuneration from the pest this season, although greatly to the detriment of their flocks. It is now a recognized fact that bonuses have been freely demanded and paid, some of which are on the percentage basis and others by lump sum. Unfortunately, the work of destruction is greatly controlled by rabbit-exporters, skin-merchants, and a huge gang of professional rabbiters, all out to make the most of the position, which is surprisingly tolerated by owners of infested lands. Therefore thorough and systematic steps for the eradication of the pest are rare. Extensive trapping was carried on till late in the year, and after rabbits were frightened and scattered poisoning without any system was resorted to in places, much of which was only patchwork, and consequently not effective. The recent big drop in the price of skins and the closing of at least some of the rabbit canning and freezing works came somewhat as a bomb-shell to those interested. The 1918 amendment to the Rabbit Nuisance Act now places the Department on a sound footing, but it is greatly deprecated by the rabbit-farmers and naturally much denounced by them. Nevertheless it is being the means of making landowners realize their responsibilities, and will eventually compel them to work hand-in-hand with the Department. Phosphorized pollard and oats, strychnine with carrots, swede turnips, or oats, and fumigating with bisulphide of carbon, charcoal, and chemical, also with lignite sulphurous coal, are all more or less resorted to, and are capable of good results if thoroughly carried out. The supply of phosphorus last winter and early spring, owing to war conditions, was limited, and thus interfered with the output of manufactured poison from our depots. Fortunately we now have a good stock on hand for the present season. The importation of phosphorus, strychnine, and bisulphide of carbon by the Department was a wise step, and is no doubt greatly appreciated by those using these commodities. Some necessary prosecutions have been instituted, and fines ranging up to £100 (the maximum) have been inflicted. The natural enemy continues to do good work where unmolested by the trapper, but no doubt hundreds of cats, ferrets, stoats, weasels, and hawks are killed annually. Wire netting is of the greatest assistance in dealing with the rabbit difficulty, but unfortunately many existing netting fences are not maintained as circumstances warrant, more especially as this article is now exceedingly costly, the price being almost prohibitive. The following are the 1919-20 sales of poison, &c., by the Department to storekeepers and settlers, also the amount of material used on Crown lands, Native lands, and railway-lines: Phosphorized pollard, 158,827 lb.; phosphorized oats, 6,124 lb.; phosphorus, 285 lb.; strychnine, 2,414 oz.; bisulphide, 315 gallons. Material used on Crown lands and railway-lines: Phosphorized pollard, 7,156 lb.; phosphorized oats, 292 lb.; strychnine, 4 oz.; cartridges, 750 (approximately); charcoal, 63 bags; chemical, 21 bags; coal for fumigating, 4 bags; bisulphide, 713 lb.

Christchurch.—During the year more and better work has been carried out for the destruction of rabbits than ever before in this district. Taken on the whole, poisoning was most successful, so that the pest was considerably reduced, but it will take more work yet to reduce the pest to pre-war dimensions. The controversy—trapping *versus* poisoning and other methods of destruction—still continues. Trapping has done more to promote the increase than it has to reduce numbers, as it kills the natural enemies, scatters the rabbits over new country, and, what is a very important factor in the increase of the pest, it thins down the bucks. Many landowners seem slow to see the vast harm done to their properties by allowing the rabbits to become numerous, and they fail to recognize that it would be far more profitable to have clean properties which would provide sufficient feed for cattle and sheep than to have the herbage eaten off and the ground polluted by rabbits. It is regrettable that the price of wire netting is so high at present that it is almost prohibitive. The question of supplying wire netting to settlers under some easy terms of repayment is well worthy of consideration where opportunity offers, as much useful and permanent work can be done by erecting rabbit-netting fences. Poisoning by phosphorized pollard or oats and the use of strychnine are still recognized by experienced landowners to be the cheapest and most effective method of dealing with the pest. Over 104,000 lb. of phosphorized pollard and 400 oz. of strychnine were sold at the Department's depots during the year, as well as 461 lb. of phosphorus. This quantity is far in excess of that sold in any previous year. Inspectors are carrying out their duties under the Rabbit Nuisance Act with tact, while at the same time they are energetically doing all in their power to get the pest reduced, such as serving notices where required, keeping in view simultaneous action on the part of owners of land in the same part of the country, &c., and also following up these notices with inspections with a view to taking action if the owners fail or neglect to take reasonable steps to promote the destruction of rabbits or are not energetic towards that end. During the year a few prosecutions were carried out and the defendants were convicted and fined with costs—the fines varying from £2 to £10. In one of these cases the permission to prosecute was given towards the end of last year. Over and above these, applications were forwarded asking for permission to prosecute in two other cases, but for several reasons these were withdrawn.

Wellington.—Though reduced in numbers in most districts and well in hand in some parts, rabbits are still much too plentiful in many parts of the district, though the work of their destruction has been vigorously pressed by Inspectors, and much more rabbit-extermination work (poisoning, &c.) than usual has been done in nearly all districts where rabbits exist. Gisborne, Wairoa, and Hawke's Bay districts are under the administration of the East Coast and Hawke's Bay Rabbit Boards, and good work has been done by both Boards in keeping the pest in check. The cost of rabbiting Crown and Native lands within their respective districts has also been undertaken by these Boards, and the cost of this work charged to this Department has been heavy. The principal method adopted by settlers for the destruction of rabbits is poisoning, the principal poison used being phosphorized pollard. During last year, however, owing to the very high price of skins, a good deal of trapping has taken place. This is a matter for regret, as the pest can much more efficiently be dealt with by systematic poisoning, fumigation of burrows, &c. Where rabbits have a high market value and trapping is resorted to the curse of rabbit-farming is almost inevitable. During the year 70,133 lb. of phosphorized-pollard rabbit poison was manufactured at the Masterton depot and sold to settlers, as against 42,259 lb. made and sold the previous year.

Auckland.—A steady fight was carried on against the pest right through the winter, with very good results, and at the end of winter it was considered that the number of rabbits was considerably less in all localities than had been the case for several years past. Unfortunately, however, the climatic conditions during the spring and summer seasons proved most favourable to their increase, particularly owing to the absence of spring floods, which can usually be relied upon to drown a large percentage of the early litters, which are those that matter most. The climatic conditions which had been so favourable to the rabbits during the summer, and would also have been favourable to their destruction by poison later, altered during February—about the time it was intended to commence the first general poisoning. The rains which have been experienced at regular intervals since have interfered considerably with poisoning operations, due both to the flush of young grass and to a great deal of poison being destroyed by rain after laying. Every effort is being made by officers to organize settlers in the different localities in their districts into committees and boards to enable the work of rabbit-destruction to be carried out systematically, and in most cases settlers are responding readily. The organization for fighting the pest in this district is now better than at any time in the past, and notwithstanding the unfavourable conditions during the past year the pest has been considerably reduced in all parts. During the year approximately 156,043 lb. of phosphorized pollard has been prepared and despatched from the Department's poison-mixing depot at Frankton Junction, as against 124,559 lb. for the year ended 31st March, 1919, and 64,880 lb. for the year ended 31st March, 1918. No difficulty has been experienced in filling all orders promptly. We also disposed of 170 oz. of strychnine and 10,000 lb. of carbon bisulphide.

NOXIOUS WEEDS.

In connection with the administration of the Noxious Weeds Act a steady request for the appointment of additional Inspectors has been received from local bodies and others, but I am of opinion that this is unnecessary if a more strict application of the provisions of the Act is carried out by the Department's officers by reducing the number of warnings given obvious defaulters, thereby enabling the Inspectors to cover more ground, instead of having to make repeated inspections to see if previous warnings have been complied with.

It is a matter for consideration whether the time has not come for an amendment to the Act by leaving blackberry alone in the Second Schedule and giving local bodies an option regarding other weeds, but with provision for the protection of the interests of adjoining local bodies through the officers of the Department retaining their powers under the Act, to enable them to enforce uniformity as between the occupiers of land in adjoining districts. Provision should also be made for road-lines to be kept cleared by the local authority, and not by the adjoining owners as at present. The administration of the Act as it at present stands has been carried out with increased energy, especially in districts where too great headway has not yet been made by a particular weed. But the application of the provisions of the Act in so far as some districts are concerned presents many difficulties, and the position will become increasingly worse as time goes on unless uniform action on the part of settlers is undertaken throughout the whole of these districts.

DAIRY DIVISION.

REPORT OF THE DIVISIONAL DIRECTOR.

The Director-General.

Wellington, 28th May, 1920.

I SUBMIT herewith the annual report of the Dairy Division for the year ended 31st March, 1920, and desire to acknowledge the help and co-operation of Mr. W. M. Singleton, Assistant Director, in connection with the supervision and control of the divisional work during the year.

D. CUDDIE, Director.

THE SEASON.

Owing to the climatic conditions prevailing it cannot be said that the 1919-20 dairying season has been altogether a favourable one for the producers of the Dominion. The autumn was unusually dry, and feed for cattle became abnormally scarce in the principal dairying districts, with the result that the quantity of dairy-produce manufactured at that time did not reach the ordinary level. When it came to the colder months of the year many of the dairy herds suffered severely. The late spring, accompanied by a continual low atmospheric temperature, accentuated the shortage of feed, and consequently many of the cows were in a low condition at the opening of the season, owing to the want of proper nourishment. For this reason there was a heavy mortality amongst the cattle, more particularly in the North of Auckland district, and the financial loss entailed proved a serious item to the settlers concerned. The early summer months gave promise of a return to a normal state of things, but this was not fully realized, and the outlook in November and December was far from reassuring from the dairy farmers' point of view, owing to the absence of sufficient rainfall. The milk-supply at factories generally showed a rapid decrease in quantity, but fortunately the position was relieved during the month of January, when much-needed rain fell, resulting in a great improvement in the pasture. Feed for stock soon became abundant, and was followed by a marked increase in the volume of milk and cream received at the factories. From then onwards a better season was assured, and although the previous shrinkage in the production has not been fully made up, the season has proved more profitable than was formerly expected.

PRODUCTION.

Notwithstanding the partially adverse weather conditions referred to, the production of cheese for the year has been in excess of the quantity dealt with for the corresponding period of the preceding year. As will be seen from the quantity tables contained in this report, this increase amounted to 71,795 cwt., or 6·27 per cent. above the production for the 1918-19 season. On the other hand, there has been a falling-off in the production of butter to the extent of 61,805 cwt., which is equal to a reduction of 17·7 per cent. during the same period. While the quantity of cheese manufactured per annum has steadily increased for many years past, there has been a yearly drop in production of butter as from the 1917-18 season, and this reduction has been greater during the season under review than in any other year. As mentioned in previous reports, the main reason for the decrease in quantity is due to lower relative prices obtainable for butter as compared with the price for cheese. In expectation of producers being allowed to receive higher market prices after the end of the present contract to sell to the Imperial Government—which expires in July—a number of the dairy companies at present manufacturing cheese have been making preparations to manufacture butter. This action is deemed advisable owing to the present high price for butter in Great Britain being far above normal. If these prices continue and producers are allowed to take advantage of them in accordance with pre-war arrangements for marketing, it will undoubtedly mean a large increase in the production of butter in the Dominion during next season. In view of the present world-shortage of butter and its importance as a food for the people it is to be hoped that those engaged in this branch of dairying will be given every encouragement to produce the maximum quantity in the years to come.

EXPORTS OF BUTTER AND CHEESE.

Although the production of butter was only moderately less than for the previous year, the quantity exported for this year shows a big decrease as compared with last year's figures. This is accounted for by the fact that very little butter available for export remained in store on 31st March, 1919, whereas on the same date in 1918 large stocks were awaiting shipment. In addition to this the quantity of butter in store at the end of the year under review totalled 186,715 boxes. Cheese, on the other hand, shows an increase both in production and exports, the total shipments being 351,907 cwt. in excess of last year's figures. This quantity, however, more than represents the actual increase in production, as the total in store awaiting shipment on 31st March, 1919, was considerably greater than that in store at the end of the present year.

The following tables show the quantities and classes of dairy-produce exported from the various grading-ports. Where not otherwise specified the figures refer to the year ended 31st March, 1920. The weight of a package of butter may be taken as 56 lb. net, and that of a package of cheese as 160 lb. net.

Creamery Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	327,031	305,138	21,591	302
Gisborne	4,720	4,720	..	..
New Plymouth	42,356	42,249	107	..
Patea	570	390	180	..
Wanganui	14,371	12,814	1,557	..
Wellington	58,530	57,394	1,136	..
Lyttelton and Timaru	33,845	32,554	1,291	..
Dunedin	9,229	8,838	391	..
Totals	490,652	464,097	26,253	302

Whey Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	6,968	397	6,288	283
New Plymouth	4,644	2,963	1,681	..
Patea	8,150	5,708	2,442	..
Wanganui	1,171	305	866	..
Wellington	6,445	5,476	957	12
Lyttelton	394	315	75	4
Dunedin	465	375	90	..
Totals	28,237	15,539	12,399	299

Dairy Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
New Plymouth	58	17	41	..
Wellington	46	..	..	46
Totals	104	17	41	46

Milled Butter to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Wellington	1,173	942	231	..
Totals	1,173	942	231	..

Butter to South Sea Islands.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	3,735	3,713	22	..
Totals	3,735	3,713	22	..

Total Quantity of Butter exported.

Port.	Creamery.	Whey.	Dairy.	Milled.	Totals.	Weight.
	Packages.	Packages.	Packages.	Packages.	Packages.	Cwt.
Auckland	330,766	6,968	..	..	337,734	168,867
Gisborne	4,720	..	..	..	4,720	2,360
New Plymouth	42,356	4,644	58	..	47,058	23,529
Patea	570	8,150	..	..	8,720	4,360
Wanganui	14,371	1,171	..	..	15,542	7,771
Wellington	58,530	6,445	46	1,173	66,194	33,097
Lyttelton and Timaru	33,845	394	..	..	34,239	17,119
Dunedin	9,229	465	..	..	9,694	4,847
Totals	494,387	28,237	104	1,173	523,901	261,950

Cheese to United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	150,079	128,167	21,801	111
New Plymouth	206,483	199,455	7,028	..
Patea	243,626	236,681	6,929	16
Wanganui	16,726	15,606	1,120	..
Wellington	251,507	225,035	26,329	143
Lyttelton	27,747	25,922	1,825	..
Dunedin	37,873	36,070	1,803	..
Bluff	96,839	95,815	1,024	..
Totals	1,030,880	962,751	67,859	270

Cheese to Australia and South Sea Islands.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	202	194	8	..
Totals	202	194	8	..

Total Quantity of Cheese exported

Port.	Packages.	Cwt.
Auckland	150,281	214,973
New Plymouth	206,483	294,976
Patea	243,626	348,037
Wanganui	16,726	23,894
Wellington	251,507	359,296
Lyttelton	27,747	39,638
Dunedin	37,873	54,104
Bluff	96,839	138,341
Totals	1,031,082	1,473,259

Quantities of Butter exported for the Years ended March, 1919 and 1920.

Port.	1919-20.	1918-19.	Decrease, 1919-20.	Increase, 1919-20.	Net Total De- crease, 1919-20.
	Packages.	Packages.	Packages.	Packages.	Packages.
Auckland	337,734	647,847	310,113	..	..
Gisborne	4,720	15,363	10,643	..	..
New Plymouth	47,058	112,536	65,478	..	..
Patea	8,720	11,420	2,700	..	..
Wanganui	15,542	22,050	6,508	..	..
Wellington	66,194	121,934	55,740	..	..
Lyttelton and Timaru	34,239	34,453	214	..	..
Dunedin	9,694	19,603	9,909	..	..
Totals	523,901	985,206	461,305	..	461,305

Quantities of Cheese exported for the Years ended March, 1919 and 1920.

Port.	1919-20.	1918-19.	Decrease, 1919-20.	Increase, 1919-20.	Net Total In- crease, 1919-20.
	Packages.	Packages.	Packages.	Packages.	Packages.
Auckland	150,281	118,386	..	31,895	..
New P.ymouth	206,483	114,745	..	91,738	..
Patea	243,626	142,008	..	101,618	..
Wanganui	16,726	12,813	..	3,913	..
Wellington	251,507	180,071	..	71,436	..
Lyttelton	27,747	16,915	..	10,832	..
Dunedin	37,873	30,067	..	7,806	..
Bluff	96,839	64,170	..	32,669	..
Totals	1,031,082	679,175	..	351,907	351,907

Quantities of Butter and Cheese forwarded to Grading-s'tores for Grading.

Port.	Year 1919-20.		Year 1918-19.	
	Butter.	Cheese.	Butter.	Cheese.
	Cwt.	Cwt.	Cwt.	Cwt.
Auckland	210,611	211,321	245,504	192,680
Gisborne	8,325	..	5,676	..
New Plymouth	38,278	222,798	44,702	214,040
Patea	5,898	280,940	4,496	240,390
Wanganui	9,825	17,840	8,164	17,300
Wellington	48,576	284,906	64,706	292,077
Lyttelton and Timaru	17,942	31,236	24,293	31,300
Dunedin	8,976	51,120	12,695	46,471
Bluff	..	115,824	..	109,932
Totals	348,431	1,215,985	410,236	1,144,190

THE CHEESE INDUSTRY.

As the result of the rapid extension in the manufacture of Cheddar cheese which has taken place during recent years New Zealand now ranks as one of the principal countries engaged in the export of this valuable food-product. In view of the increasing demand on the world's markets for other milk-products, including butter, condensed milk, and dried milk, it is impossible to say at this juncture to what extent a further rapid development in cheese-production will take place in this country even in the immediate future. All will depend upon the relation of the prices obtainable for the respective milk-products, and the net return to the farmers who favour this branch of dairying in preference to others which may be considered equally profitable.

It may be mentioned, however, that during the period under review preparations have been continued for the future extension of the cheese industry in many districts where dairying is being commenced on land not formerly used for this purpose. Moreover, many of the dairy companies already in existence have also decided to enlarge their cheese-factories in order to cope with an increased supply of milk. Therefore the present outlook is by no means unfavourable towards the continued production of a large annual output of cheese, and so long as the quality of this product can be maintained at a comparatively high average standard remunerative prices may be expected.

The total quantity of cheese dealt with at all grading-ports for the year amounted to 60,799 tons. This was manufactured in 384 factories, of which 260 are situated in the North Island. Of these factories 347 are carried on by co-operative dairy companies and the remainder are in proprietary ownership.

Quality of Cheese.

So far as the quality of the cheese manufactured for the season is concerned, it can be said that some improvement has taken place. This applies more particularly to the cheese manufactured from the beginning of September to the end of December. During that time many of the factories produced a uniformly good-flavoured article, and a lesser number continued to do so to the end of the period to which this report refers. The cheese from these factories was well made and practically free from blemish of any material kind, and must therefore give full satisfaction alike to merchants and consumers. As soon as the warmer weather set in, however, a considerable quantity of the cheese then manufactured was found to be faulty and irregular in flavour, the consignments from many of the factories possessing a flavour that was decidedly objectionable and altogether foreign to cheese made from milk which had been handled in a careful and cleanly manner on the farm. While the percentage of ill-flavoured cheese has not been large in proportion to the total quantity received, it is essential in the interests of the industry as a whole that steps be taken to further reduce the quantity by every practical means at the disposal of those who are immediately concerned.

As regards the body and texture of cheese, for which the factory-managers have to accept the greater part of the responsibility, it may be said that little or no fault could be found in many of the consignments offered for export, the cheese being close in body and possessing the right degree of firmness which is so characteristic in a well-made cheese. On the other hand, numerous consignments came forward which were more or less defective in body and texture. For instance, looseness and openness in body, which is always looked upon as a serious fault in cheese, was altogether too common. Where this irregularity was general, and in an acute form or attended with other defects, it was necessary to classify the produce as second grade, which represented a loss of $\frac{1}{4}$ d. per pound to the producer, to say nothing of the harm resulting to the industry when such cheese is placed on the market. Although a remedy which will completely overcome this fault in cheese under all conditions is not yet available, it can be greatly minimized by close attention to the process of manufacture recommended by the Instructors of the Division.

Over-acidity, which interferes with the appearance and also with the food value of the product, came under notice to a greater extent than usual during a part of the season, but was quickly corrected by the factory-managers after their attention had been drawn to it by the Instructors or per medium of the grading-certificates.

Taking the year's work as a whole, and making due allowance for the irregularities referred to above, the cheesemakers of the Dominion generally have carried out their duties in a careful and competent manner, and have given evidence of anxiety to manufacture a product which would be up to the standard desired.

Cool Storage of Cheese.

The New Zealand cheese-producers are now in the fortunate position of being able to forward their cheese direct from the factory to an approved cool store at every grading-centre in the Dominion, where it can be held in first-class condition up to the time of shipment and transshipment. The temperatures of these stores—with one exception—have been controlled in such a way during the season as to ensure the safe preservation of the produce and prevent anything in the nature of excessive shrinkage in weight. The lower temperatures have also had the effect of preventing the serious development of the mite pest which occurred in former years, and which necessitated the fumigation of the stores for the destruction of the mites when cheese was held for a lengthy period awaiting shipment.

At the end of the 1918-19 season there were no less than 474,754 crates of cheese in stock, and it was feared that sufficient cool-storage space would not be available for the output of the incoming season, but early shipments were made and continued with unexpected regularity through the year. Consequently this fear was not realized to any material extent, for although there has been a shortage of space in the cool stores at Auckland this did not occur until towards the end of the year, and the weather being then much cooler no damage to the produce is anticipated.

The only weakness in the storage for cheese that now exists is in respect to the transshipments forwarded to Wellington from Patea and Wanganui, and occasionally from New Plymouth. Room cannot be found for these transshipments in the Wellington cool stores, as it is required for the cheese from the nearer provincial factories and those in the Nelson and Marlborough districts. As long delays frequently take place before transshipments of cheese can be loaded on the ocean-going steamers, the cheese which has previously been cooled at the district stores becomes overheated and more or less spoiled. Such treatment is grossly unfair to the buyers of the produce, and must also seriously affect the reputation of the dairy companies concerned. Therefore it is imperative that means be provided whereby all transshipments of cheese can be immediately cool-stored on arrival at Wellington. If that can be accomplished it will bring the storage of cheese in New Zealand up to date and in keeping with the importance of the industry.

Pasteurization of Milk at Cheese-factories

As a cheese-producing country New Zealand leads the way in respect to the application of the principle of pasteurization to this branch of the dairy industry. Its introduction has been the means of greatly improving not only the flavour of the finished product but also its keeping-quality. Factories from which cheese of indifferent flavour was being turned out year after year are now producing an article which is usually sound in flavour and altogether superior to that formerly made from unpasteurized milk. The demand for regenerative pasteurizing-machines—which is invariably the type used—has been greater than the supply. As additional plants are imported or manufactured locally they are eagerly purchased by dairy companies which have decided to adopt this system of treating the milk for the manufacture of cheese. The number of factories at which these machines have already been provided is 155, and the total quantity of cheese manufactured from pasteurized milk amounted to 32,200 tons, equivalent to 53 per cent. of the year's production.

THE BUTTER INDUSTRY.

Creamery Butter.

Apart from the reduction in the total quantity of creamery butter produced for the year, this branch of dairying has been carried on even more successfully than during the preceding season.

In the Auckland Provincial District, where the greater portion of the output is manufactured, there has been a noticeable improvement in the quality of the finished product reaching the central stores for grading and shipment. The progress in this respect can be correctly attributed to the comparatively cool weather during the beginning and middle of the season. Another reason for this improvement is the extension of the system of cream-grading, and more especially the payment of a differential price for the cream according to grade. Furthermore, the recent amalgamation of the larger dairy companies operating in the Waikato has also had its effect in a similar direction. The disastrous element of competition for the supply of cream which formerly existed in this locality has been almost eliminated. The result thus achieved may be taken as an encouragement towards a wider adoption of the cream-grading system, and also towards a better understanding as between the dairy companies regarding the competition for the raw material.

The quality of butter made in Taranaki, Wellington, Canterbury, and Otago has been well up to that of the average of these Provinces in former years, and numerous consignments came forward for which the makers well deserved credit. The flavour of that from the leading factories was excellent, and all possessed that degree of uniformity which is much desired in the product in order to maintain the country's reputation for butter of the best quality.

Although the foregoing is true, it has to be admitted that the butter from quite a number of the factories was not up to such a high standard. The faults were mainly in flavour, and showed unmistakable signs of previous deterioration in the cream from which it was made. It is undoubtedly one of the weak points in the system of selling that butter which merely reaches first grade, or little more, can be disposed of for a price equal to that from the factories which receive the highest pointing. Providing even a small premium were paid for the latter it would be the means of stimulating greater interest in the production of the best quality. Fortunately the quantity of second-grade butter made in New Zealand is small and only amounted to 5·6 per cent. for the period covered in this report.

The body, texture, and colour of the butter made during the year calls for no special comment, as this feature of the work is as a general rule carried out by the factorymen in a manner which is highly commendable.

Whey Butter.

Although the manufacture of whey butter at cheese-factories can only be considered a side-line, by means of which it is now possible to save the butterfat which formerly came under the heading of an unavoidable loss, where the necessary care is exercised it is a side-line which is netting a good return for the capital invested in the plant and machinery specially required for this purpose. The quantity of whey butter received at the grading-stores for the year amounted to 18,739 cwt., valued at £149,292, taken at the price paid for this product under the contract for sale to the Imperial Government. With this additional amount of revenue at their disposal there can be no question of the wisdom of dairy companies in devoting their attention to this particular branch of the industry.

The year has marked a considerable change in the manufacture of whey butter on the part of a number of the cheese-factories, from which a product of fine quality has been turned out, and it has been in contrast to the inferior article formerly made. The results obtained at these factories are an object-lesson in what can be accomplished when the details of the process as recommended are put into daily practice. It is no exaggeration to say that the best whey butter produced has been superior to some of the creamery butter made under the home-separation system. On the other hand, the quality of the whey butter consigned to the grading-stores by other companies had nothing to commend it, some consignments being ill-flavoured and most objectionable as a product intended for human consumption. The cause of such inferiority is entirely due to lack of care and of interest on the part of the makers, who apparently have no desire to do better work for their employers.

As a general rule, the appliances in which the whey is handled prior to separation have been found in fairly good order and showed an improvement during the year, but the Instructors in the ordinary course of their duties have had to insist on the separation of the whey being discontinued at factories where the plant and utensils have been allowed to become unclean or insanitary. For instance, the use of ordinary galvanized piping for the conveyance of whey to the separators, and which cannot be maintained in a thoroughly clean condition, can no longer be permitted, as it is a fruitful source of contaminating the product. Given the right class of plant and fittings, together with a reasonable amount of skill and attention, no factory need manufacture whey butter of inferior quality.

Moisture in Butter.

In order to prevent the export and sale of butter which contains more water than the legal standard of 16 per cent., it is found necessary to take a large number of samples at the time of grading, and to subsequently test these samples for water-content. The number of such samples dealt with during the year amounted to 15,047, showing an average of 15·007 per cent. of water, as compared with an average of 15·09 per cent. for the 1918-19 season.

Acting under the statutory power conferred by the Dairy Industry Amendment Act, 1915, the butter which was found to contain an excess of water was reconditioned and the percentage reduced to conform with legal requirements, the expense incurred in this respect being made a charge against the owners of the produce, who were compelled to dispose of it in the manner prescribed. Only in the case of a fractional excess was the butter allowed to be returned to the manufacturer. Generally speaking, the law regulating the quantity of water permissible in butter has been well observed; but where offences of this nature are repeated it would seem necessary to prosecute the owner, and where a conviction is obtained to ask the Court to inflict a substantial penalty.

GRADING OF BUTTER AND CHEESE.

It is now over twenty-five years since the compulsory grading of butter and cheese was commenced in New Zealand, which was the first country to introduce the system, and it has been continued without interruption to date. The grading from year to year is now more or less of a routine nature, and calls for little comment in this report. It is sufficient to say that the past year's work has been conducted on a similar basis to that in vogue in former years. Consignments of butter and cheese reaching the cool stores have in all cases been promptly handled, graded, and stamped with the corresponding official mark in readiness for export at the first opportunity. The grading-stores have been frequently visited during the season by dairy-factory managers, who have been given the opportunity of examining the produce from their own and other factories then being graded. Several grading conferences were held in the North Island during the year, and with two exceptions were well attended by members of the New Zealand Dairy Factory Managers' Association. At these conferences a large quantity of cheese and butter in store was carefully examined by the members of the association and officers of the Division. Some valuable discussions on the quality and packing of the produce took place, which was evidently appreciated by those in attendance.

Table showing the Grading-points scored by the Butter and Cheese graded throughout New Zealand for the Year ended 31st March, 1920.

Grading-points.	Butter.		Cheese.	
	Number of Boxes.	Percentage of Total.	Number of Crates.	Percentage of Total.
75	39	0.0060	..	..
77	44	0.0067	..	..
78	7	0.0001	118	0.0133
78½	56	0.0086	8	0.0009
79	74	0.0114	132	0.0155
80½	62	0.0095	..	..
81	108	0.0166	103	0.0121
81½	95	0.0014	..	..
82	565	0.0872	573	0.0673
82½	78	0.0012	149	0.0175
83	554	0.0855	268	0.0315
83½	1,384	0.2136	721	0.0847
84	2,466	0.3806	2,279	0.2679
84½	3,039	0.4690	4,210	0.4949
85	5,381	0.8305	8,219	0.9662
85½	6,766	1.0443	11,541	1.3568
86	9,770	1.5081	21,606	2.5400
86½	5,374	0.8294	11,477	1.3492
88	5,187	0.8006	31,860	3.7456
88½	17,069	2.6346	3,259	4.2627
89	30,717	4.7411	77,172	9.0726
89½	30,734	4.7438	97,915	11.5113
90	43,031	6.6418	125,975	14.8101
90½	61,600	9.5079	110,643	13.0076
91	74,427	11.4887	98,916	11.6289
91½	77,754	12.0013	77,722	9.1373
92	84,135	12.9862	67,380	7.9214
92½	59,808	9.2313	32,493	3.8200
93	40,946	6.3200	20,398	2.3980
93½	30,747	4.7458	9,618	1.1307
94	27,258	4.2072	2,631	0.3092
94½	12,623	1.9483	212	0.0249
95	10,579	1.6328	..	..
95½	4,683	0.7228	..	..
96	554	0.0855	..	..
96½	162	0.0250	..	..

CREAM-GRADING.

Up to the present time the grading of cream and the payment for same according to grade has not extended beyond the butter-factories located in the Province of Auckland, but as this is the principal butter-producing district in the Dominion it is encouraging to find that the value of the system is being realized more and more as it becomes better understood by farmers and factorymen. Where the grading of cream has been adopted, and payment arranged on a scale which provides for a reduction in the price for cream below the standard of first grade and a premium for that which is superfine (scoring 92 points and over), there has been a noticeable improvement in the supply, with a corresponding improvement in the quality of the butter made therefrom. It has now been clearly demonstrated that the grading of cream is a practical means of uplifting the quality and value of this product. What is now required is an application of the same method of grading in other districts where cream is at present being accepted at the factories at a uniform price irrespective of its condition and comparative value at the time of delivery.

Those who are supporting the grading of cream recognize the importance of arriving at some uniformity in connection with the standard set for each grade or class by the various factories, and with this end in view several cream-grading conferences have been held during the year, which were attended by factory-managers and Instructors of the Division. At these conferences a considerable quantity of cream was examined and a decision arrived at as to the grade in which each consignment should be classified.

It has been found that where cream-grading and instruction on the farm in the treatment and care of the product go hand-in-hand progress towards the desired end can be more rapidly accomplished.

MILK-POWDER.

The question of establishing an additional number of factories for the drying of milk has received much attention from co-operative dairy companies during the year, the subject having been discussed in practically every dairying district in the Dominion. Shortly after the end of last season a number of the dairy companies operating in the Taranaki and Wellington Provinces jointly arranged for delegates to proceed to the United States of America, Canada, Great Britain, and Holland, with a view of collecting the latest information as to the payable nature of this and other branches of dairying, the methods of conducting the business, the class of machinery used, and the prospects for future development of the trade in milk-powder. Although the report furnished by the delegates shortly after their return to New Zealand has not been published, it is understood to be of a favourable nature, and more or less in accordance with the report of Mr. W. Dempster, Dairy Instructor, who visited the above-mentioned countries at the same time on behalf of the Government. The report of this officer on the investigations made by him in this connection appeared in the February number of the *Journal of Agriculture*, and contains information which should be helpful to dairy companies in any action it is proposed to take regarding the manufacture of milk-powder.

The success which has attended the drying of skim-milk, more particularly in America, lends encouragement to the co-operative interests in New Zealand, and if prices for this class of powder are maintained further developments in this branch of dairying may be looked for in the near future. In addition to the four large milk-powder factories which have been in existence for a number of years, and which are controlled by private enterprise, one co-operative company has already erected a modern factory of this nature at Waharoa, in the Waikato, and is expected to commence operations at an early date, while several others are now under way. The co-operative companies concerned in this new movement intend to confine their operations almost wholly to the drying of skim-milk, the cream from which will be made into butter. Some attention is also being given to the drying of buttermilk at a number of the larger butter-factories, and it is believed that plants for this purpose will be provided as soon as they are procurable.

The venture in co-operative milk-powder factories is being carefully watched by others who are in a position to take advantage of similar facilities providing such a step be warranted.

CASEIN.

One of the aims of all dairy companies should be to make the maximum profit by an economical use of all the by-products from their factories, whether it be by a process of manufacture into a marketable article or by otherwise disposing of them to the best advantage. The by-products from a butter-factory where whole milk is received are, strictly speaking, skim-milk and buttermilk. In the case of the "home separation" factories, of course only the buttermilk is available. But when the casein is extracted from the skim-milk and buttermilk there remains the additional by-product of casein whey in considerable volume, which is either returned to the farmer as a pig-food or is allowed to go to waste.

Under present-day conditions it is a moot point as to whether the extraction of the casein or the complete recovery of all the solids in the skim-milk and buttermilk by a process of drying to a powder will prove the most profitable. Pending a closer acquaintance with the methods and cost of drying these products to a milk-powder, a number of dairy companies are devoting their attention to the extraction of casein from one or other or both of these liquids. The number of companies following this course has recently increased, the casein being prepared in curd form at precipitating-stations and from there forwarded to a central factory, where the process is finally completed and the casein made ready for marketing.

It is estimated that the total output of casein for the year has been 1,000 tons, the greater bulk of which has been of the lactic variety. Owing, however, to a keener demand arising for rennet casein at higher values, its manufacture was commenced at a number of the precipitating-stations about the middle of the season. But while some success was attained the quality generally was not altogether satisfactory. It was found that the factories had to be specially fitted up for this branch of the work, and that a mechanical stirring-apparatus was indispensable in making this class of casein. Subsequently some really good rennet casein was prepared, and it is now evident that the difficulty at first experienced has been overcome. An unusual defect in the casein at the curd stage when extracting on the "lactic" system was met with principally in the Waikato district. This defect made its appearance in the form of the curd turning a distinct pink colour. Although the actual cause was not traced and duly identified, it was overcome by changing to what is known as the sulphuric-acid system, which produced a good casein of equal value to that of the lactic method.

The quality of a considerable portion of the casein graded during the year was lacking in uniformity, more particularly that from the Taranaki and Wellington Districts. This has been put down to the want of experience amongst some of those who are in charge of the precipitation-stations, and also to the length of time which frequently elapses before the green curd reaches the drying-factory. Casein-manufacture, like any other branch of dairying, must be conducted by those who have received a good training and have also had the necessary experience before the best results can be expected.

The Instructor in the preparation of casein has had his hands full in attending to the many phases of the industry, including the grading of the product, and he has done exceedingly well in carrying out the respective duties in connection therewith.

INSTRUCTION IN FACTORY-DAIRYING AND DEVELOPMENT.

The benefits derived from the strong element of co-operation which exists between the directors of dairy companies, their managers, and the Instructors of the Division are far-reaching, and this united effort enables these latter officers to render the maximum amount of help in carrying on the industry to the advantage of all who are connected therewith. During the year the Instructors engaged in this class of work have been successful in helping factory-owners to a very great extent, and their efforts in this direction have been appreciated.

Outside of the disposal and marketing of the finished products the help thus afforded embraces practically every section of the work which comes under the heading of dairy-factory interest and control. Beginning with the formation of the dairy company, the Instructor's advice is usually followed at each stage of the procedure, and includes the selection of site, size and nature of the buildings, and equipment of machinery and accessories.

An equally important feature of the work at all times under supervision is the maintenance of factory buildings and surroundings in a sanitary state. Where alterations or extensions to factories are contemplated, and additional machinery is required to cope with an increase in production, such work is now rarely undertaken without consultation with the Instructor for the district, whose advice is almost invariably accepted. Co-operation of this kind makes it possible to keep the factories up to a more uniform standard of efficiency, and greatly aids in the manufacture of products which are similar in quality and general appearance. Furthermore, the actual process of making cheese and butter comes in for a large share of the Instructors' attention, and where the methods followed are not in keeping with an approved principle the former are corrected as far as possible and suggestions made for carrying on the work to better advantage.

INSTRUCTION TO RETURNED SOLDIERS.

An officer of the Division has frequently attended classes at the Trentham Military Hospital for the purpose of giving lectures and demonstrations in the testing of milk and cream by the Babcock method. At these lectures the subject of herd-testing was also discussed. The Instructors of the Division have also visited a number of the returned soldiers who were about to commence dairy-farming. Plans for milking-sheds were supplied to them, and advice given as to the construction of the buildings, &c. At two of the soldier settlements in the Wairarapa district, where it was decided to form co-operative companies and provide buildings and machinery to manufacture cheese, one of the Instructors was deputed to go fully into the matter with the parties concerned, when it was agreed that the Instructor should make all arrangements for the preparation of plans for the buildings, attend to lists of machinery, and generally supervise the work up to the time both factories are ready to commence operations. The necessary capital required has been provided by the Repatriation Department.

CONDITION OF MILK AND CREAM SUPPLIED TO DAIRY FACTORIES.

It has again been forcibly demonstrated during the year that many herds of cows are being milked under conditions which should not be allowed to continue. Numerous instances could be quoted where the Instructors in the course of their duties have found milking-sheds, yards, milk-stands, milking-machines, and dairy utensils in a most insanitary state, due to either neglect or lack of knowledge on the part of the owner or employees. That many of the dairy premises as well as the apparatus and utensils used therein are kept in a clean and satisfactory condition goes without saying. At the same time a really large proportion are in need of immediate improvement in this respect.

The most serious phase of the question, however, is in relation to milking-machines, which are frequently allowed to become so foul through want of a thorough daily cleaning that the milk passing through them is contaminated to such an extent as to render it wholly unfit for the manufacture of any food-product. It is to be regretted that no provision has been made on many of the farms for a supply of boiling water and the necessary set of tube-brushes, which are indispensable for the proper cleaning of these machines. Every dairy-farmer should be compelled not only to provide such facilities, but also to use them in his own interest as well as that of the consuming public. It would seem advisable to consider the question of issuing a license to all users of milking-machines, which could be cancelled if the appliances were not maintained in good order. If the registration of dairies be essential to attain a desired standard in the case of milk required for city supply, it is surely as important to in some way protect the purity of milk which is used for the manufacture of butter and cheese or any other milk product.

A measure of protection against this evil is already provided for in the districts where Instructors have been appointed by special arrangement with the dairy companies, as these officers are continually visiting the farms belonging to the suppliers of the companies with which they are associated, for the purpose of advising the owners thereof and, where necessary, insisting upon an improvement in the methods employed in handling the milk and cream, including the cleaning of the appliances referred to. Twelve Instructors are now engaged in this special work, and at least two others will be appointed in the immediate future by arrangement with two of the dairy companies operating in districts covering a wide area from which cream-supplies are drawn. In addition to this effort, which has been attended with much success as far as it has gone, the Instructors in cheese and butter making, who are regularly visiting the factories, have devoted as much time as possible to instruction on the farms from which inferior milk or cream is being received. The number of farms where instruction is urgently needed is so large, however, that all cannot be attended to with the limited help available from this source. It is therefore quite evident that the early appointment of additional Instructors who can be deputed to specially confine their duties to this work alone is highly desirable for the welfare of the industry as a whole.

MILK AND CREAM TESTING.

Following the practice of former years, the Divisional Instructors have given attention to the testing of milk and cream samples at the factories when requested to do so by the directors or manager of a dairy company. These requests have generally been made as the result of some dissatisfaction having arisen with the factory tests amongst the suppliers. As a rule, such action on the part of the

officers confirmed the correctness of testing as carried out by the factory employees, but in some instances it was found necessary to recommend an alteration in the method which had been previously followed.

The arrangement entered into between one of the largest co-operative dairy companies in the Dominion, whereby the whole of the milk-samples are regularly tested for butterfat by an officer of the Division, has proved satisfactory both to the directors and milk-suppliers of the company, and the fairness and accuracy of the work has not been questioned by either party.

The central testing-room at Wellington, to which samples of milk and cream can be forwarded from any part of the Dominion for attention, has been utilized to a considerable extent during the year. In all cases where the samples are taken in the presence of the milk or cream supplier and a representative of the factory the tests are completed as a check against the factory result, and in this way many misunderstandings are cleared up with evident acceptableness to the farmers concerned.

It would seem advisable that the Department should again provide for the official testing of all calibrated glassware used at factories in making the Babcock test, and that such glassware be specially marked when found correct, as was done during certain periods in the past. At the present time the greater portion of this glassware is checked for accuracy by a private firm, and while there is no reason for believing that this is improperly attended to it would certainly be preferable to have it carried out under official control. The Department should go further and make provision whereby no dairy company or dairy-factory proprietor should be allowed to use glassware which has not been correctly calibrated and duly certified on each part thereof. It should also be made an offence against a law or regulation for any one to knowingly underread the percentage of fat as shown in the milk- or cream-test bottle.

TESTING OF DAIRY HERDS FOR BUTTERFAT-PRODUCTION.

The testing of dairy herds under the association system has shown a greater extension during the last twelve months than in any equal period since its commencement. In the first place this extension can be attributed to the keener interest taken by dairy farmers in the need for herd-improvement, with its consequent increase in production and higher monetary returns from the individual cows of which their herds are composed. It can also be stated that the continuous advocacy of the Division by means of lectures, distribution of pamphlets, and articles written and published per medium of the Department's *Journal*, together with personal interviews with farmers by the responsible officers in support of this all-important work, has done much to further the progress which can be recorded for the year. The method of utilizing as far as possible the services of those officers who have been specially appointed in connection with the certificate-of-record testing of purebred dairy-stock has proved successful in coping with extra duties entailed in the testing of ordinary dairy herds.

The number of associations in active work under the control of the Division for the season has been twenty-seven, representing 422 herds comprising a total of 10,460 cows, the records of which have been regularly prepared in accordance with the milking-period, which, of course, has varied in length in the case of some herds and individual members thereof. This shows an increase of 219 per cent. in the number of herds and 202 per cent. in the number of cows tested as against the figures tabulated for the previous year. Over and above the number of cows dealt with by the Division on behalf of their owners, it is estimated that 14,740 cows have been tested for the whole or part of the season by private arrangement.

The year's work as regards the organization of associations, the monthly testing of milk-samples, and the compiling of individual returns on behalf of herd-owners has taken up much time and occasionally overloaded the available staff, but the results obtained have fully warranted the effort made to create a wider interest in herd-testing. The advancement made and the results achieved, as indicated by the greater production on farms where herd-testing has been intelligently practised for a number of years, in building up a herd of high-producing cows by careful selection and approved breeding, is stimulating groups of farmers to commence the same practice in other districts. On this account the formation of an additional number of associations is already assured for the coming season, provided the requisites can be secured.

CERTIFICATE-OF-RECORD TESTING OF PUREBRED DAIRY COWS.

The certificate-of-record testing of cows registered by different breeders' associations, which is under the independent control and direction of the Dairy Division, constitutes a work of the first importance by reason of its far-reaching effect not only on the owners of the cows under test, but other breeders, and also on all dairy-farmers who desire to improve their ordinary crossbred herds by introducing purebred strains from foundation stock the productive capacity of which has been duly authenticated. This branch of the Division's work was commenced a little over seven years ago, and has shown steady advance and the greatest increase during the past year, with every prospect of further extension in the immediate future. A full account of the results being obtained in respect to certificate-of-record testing, together with valuable articles on the subject covering the year's operations, have appeared in the *Journal of Agriculture*, from the pen of Mr. W. M. Singleton, who is in charge of this branch of the work. The various breeders' associations, and also many of their members who have taken advantage of the facilities provided for by the certificate-of-record testing-system, have shown the fullest satisfaction with the methods employed. It is therefore quite evident that this work has the confidence, as well as the appreciation, of those who are directly concerned.

STAFF.

It is desired to mention that the Instructors, Dairy-produce Graders, and Milk-testers of the Division have carried out their various duties in a competent manner during the year. One and all have undoubtedly rendered valuable assistance to the industry in their respective spheres, with evident satisfaction to the producers as well as to the Department. The clerical staff have also performed their duties with care and exactness, thereby materially contributing to the general success of the work undertaken by this branch of the Public Service.

HORTICULTURE DIVISION.

REPORT OF THE DIVISIONAL DIRECTOR.

The Director-General.

Wellington, 18th June, 1920.

I HAVE pleasure in submitting herewith the annual report of this Division for the year ended 31st March, 1920.

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 regarding orchard shelter, hedges in general, &c.
- (7.) Control of the Horticultural Stations at Te Kauwhata, Tauranga, and Arataki.
- (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 season's fruit crop has been a very satisfactory one. Apples and pears have yielded heavy crops, whilst the return of stone-fruits was above the average in most localities. Satisfactory prices are being realized by growers, especially those who take care to forward nothing but clean, well-graded fruit.

Brown-rot disease in stone-fruit has been less prevalent, although in some localities apples and pears were attacked to a slight extent. Black-spot infection was again fairly conspicuous, especially in the Nelson and Motueka districts. Other diseases and pests have been more easily kept under control. The Orchard Instructors report that considerable improvement is noticeable in the management and care of orchards generally.

A pleasing feature is the large number of returned soldiers who have taken up fruitgrowing under the repatriation scheme. With one or two exceptions they are promising to become a valuable acquisition to the various districts in which they are settled. Assistance is given them as far as possible by the Instructors, both by practical demonstrations and written advice.

The demand for information on fruitgrowing matters has increased to a considerable extent, and involves a large amount of correspondence as well as special visits.

The Assistant Director, Mr. J. A. Campbell, who spent the major portion of the year investigating the horticultural industries of the United States of America and Canada, returned to the Dominion in December last. During his visit Mr. Campbell secured a large amount of valuable information, particularly in connection with the grading and packing of fruit, co-operation, and marketing. This information is being passed on to the New Zealand fruitgrower, and should in the near future have a beneficial effect on the fruitgrowing industry of this country.

The area planted during the year in new orchards was 494 acres, which is a slight decrease on that planted the previous year. The following figures show the area in acres planted during the 1919 planting season : Whangarei, 15 ; North Auckland, 55 ; South Auckland, 22 ; Poverty Bay, 14 ; Waikato and Bay of Plenty, 5 ; Hawke's Bay, 108 ; Taranaki, 21 ; Manawatu and Wairarapa, 11 ; Nelson and Motueka, 80 ; North Canterbury, 120 ; South Canterbury, 13 ; Otago, 30 : total, 494 acres.

Outbreak of Fire-blight.—Towards the end of the year an outbreak of fire-blight disease in fruit-trees occurred in the Auckland District. Steps were immediately taken to prevent any further spread of the trouble. A thorough inspection of all orchards and nurseries in the affected district was commenced, and all suspicious infections destroyed by burning. The work is proceeding satisfactorily, and it is anticipated the disease will be successfully checked. Quarantine regulations will be gazetted at an early date.

Export of Fruit.—A commencement has again been made in the export trade in fruit, which had ceased in 1916 owing to lack of shipping facilities brought about by the war. Considerable difficulty was experienced in obtaining shipping-space, but arrangements were made for the shipment of some 15,000 cases to London by the s.s. "Athenic," sailing early in April, and further consignments by two later boats. Every care is being taken at this end to ensure the fruit arriving at destination in good condition, and it is hoped the results will be entirely satisfactory. The shipments are being made under the Government guarantee of 1d. per pound to shippers. The new export regulations recently gazetted should greatly assist in the proper grading, packing, &c., of fruit for export, and thus place the industry on a sound footing. The following figures show the number of cases exported in each export season from 1908 to 1916: 1908, 1,236; 1909, 191; 1910, 5,647; 1911, 6,031; 1912, 14,869; 1913, 33,000; 1914, 67,964; 1915, 62,164; 1916, 19,246.

Apple Grading and Packing Classes.—These classes have been continued during the year in the main commercial centres, and were well attended. Six persons sat for the Department's certificate, and of these one gained a second-class certificate of competency to pack fruit. The numbers of certificates issued to date are—Six first-class certificates in fruit-grading, seventeen first-class certificates in fruit-packing, and two second-class certificates in fruit-packing.

Demonstrations by Orchard Instructors.—The usual practice of giving demonstrations in up-to-date methods in pruning and spraying during the winter months has been continued during the year by the Orchard Instructors in their respective districts. Keen interest is manifested in these demonstrations by growers and others, many coming long distances in order to be present. There is little doubt of their desire for knowledge in all matters pertaining to the improvement of methods of production.

Co-operative Fruit-testing Areas.—A number of these plots have now reverted back to the owners, the term for which they were taken having expired. Valuable results were obtained from the bulk of the areas, and some of these have been published in the Department's *Journal*. Some forty-two plots remain in operation in different parts of the country, the agreement in connection with these being still in force.

Spraying Experiments.—The carrying-out of experiments for the control of orchard diseases and the testing of various spraying-compounds has been continued during the year. It is of the utmost importance to growers that reliable brands of sprays be used, and it is in their interests that these tests are conducted by the Division. The work is carried out at the horticultural stations, and in private orchards in co-operation with the fruitgrowers' association. Tests for the control of the following diseases were made: Brown-rot, black-spot, red mite, brown beetle, silver-blight, apple-leaf hopper, pear-leaf-rolling midge, and verrucosis of lemon. Manurial experiments were also conducted on fruit-trees. Particulars of the results obtained are published in the *Journal* in due course.

Fruit Cool Storage.—Comprehensive experiments in the picking, handling, and packing of fruit for cool storage were undertaken last season. This was done with the view of assisting growers and to help the cool-storage companies to improve their present working-practices, and at the same time to ascertain the storage qualities of the different varieties of apples and pears. Full details appeared in the January, 1920, number of the *Journal*. Arrangements have been made for the continuation of the experiments next season.

Fruit-preserving Industry Act.—The assistance given under this Act for the erection of cool stores and packing-sheds has been of great value to the fruit industry. The total advances made to date represent some £84,500. It is estimated that the quantity of fruit placed in cool store this season will greatly exceed that of former years.

Orchard Registration and Orchard Tax.—Some 7,563 commercial orchards were registered during the year, and £1,894 collected in orchard-tax. The moneys 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.

REGISTRATION OF NURSERIES.

This work is progressing satisfactorily, and reports received from the Instructors indicate that nurserymen generally are eager to comply with the regulations. 454 nurseries were registered, being an increase of forty as compared with last year. The fees collected totalled £458 5s.

HORTICULTURAL STATIONS.

Te Kauwhata (Lower Waikato).

A successful season has been experienced at this station. The fruit crops were heavier, and the weather conditions enabled fungoid disease to be more easily kept in check. On the fruit-farms the trees have made splendid growth, and the same applies to the trees in the old nursery and the home orchard. The grape crop was an excellent one, the weather being very favourable during both the setting and ripening periods. The lucerne area has done well considering the dry season. One cutting was made in December and another in February. The autumn-sown plot is well ahead of that sown in the spring, the former at the end of March being 9 in. high. 350 tons of wattle-bark have been stripped in good order and some 60 tons disposed of in the bundle. The plot sown in clover to ascertain the value of such covering in checking the spores of black spot, as against cultivated land, has been further tested, but with no apparent result.

A good demand continues for the wine made at the station, particularly for Frontignac (sweet red). The following are particulars of wines sold during the year: Frontignac, 6,788 gallons, value £4,018 16s.; Madeira, 969 gallons, value £581 8s.; claret, 688 gallons, value £354; hock, 557 gallons, value £293; unfermented, 22 gallons, value £13 4s.; total, 9,024 gallons, value £5,260 8s.

Arataki (Hawke's Bay).

The weather throughout the year was exceptionally dry, the rainfall being considerably below the average. Such conditions are against growth, particularly on this station, where the soil is shallow and overlies shingle. Heavy frosts during April caused a fair amount of injury to the immature wood of both grape-vines and fruit-trees, whilst late frosts during November injured the

grape crop and seriously damaged the potato crop. Apricots were a total failure, but all the other varieties of fruits bore good crops. Owing to injury by frosts the grape crop was a light one. The whole of the orchard was divided up into blocks for various spraying experiments, and a portion of a neighbouring orchard was taken over for the same purpose. Very comprehensive tests were carried out for the control of brown-rot and red mite. In the vegetable-garden a few trials were carried out, but on account of the dry weather the results were not satisfactory. Tests with different varieties of tomatoes were carried out, and the results were fairly satisfactory. Several demonstrations in orchard cultivation, spraying, &c., were carried out during the year, and two field days held under the auspices of the Hawke's Bay Fruitgrowers' Association. There was a good attendance of fruitgrowers on each occasion. The unfavourable weather was rather against seed-germination in the herb-garden. Nevertheless some varieties have made satisfactory progress.

Tauranga (Bay of Plenty).

Good progress has been made with the various operations at this station. Great interest is being taken in the citrus-testing area. This is evidenced by the number of people from other districts who have visited the station seeking information. The trees are making good growth and commencing to carry fair crops of fruit. Tests are also being made in the growing of pomegranates, guavas, and the avocado or alligator pear. The latter promises to succeed well in the district, the trees making good progress notwithstanding a very cold winter. Trials with different varieties of maize, kumeras, and tomatoes were made during the year. Spraying tests for the control of orchard pests and diseases were continued.

PAPANUI EXPERIMENTAL ORCHARD, CHRISTCHURCH.

Experimental work, which is a leading feature at this orchard, has been pushed on during the year. The results of the various spraying tests, &c., are published from time to time. Fruitgrowers in the district are showing great interest in the various operations, and the demonstrations given periodically are largely attended.

AVONHEAD TRAINING-FARM.

A farm under the repatriation scheme, in conjunction with this Department, has been established at Avonhead for training returned soldiers. The portion of the farm coming within the scope of this Division up to the present is about 9 acres, of which approximately 4 acres have been planted in fruit-trees. Shelter-belts have been set out, and a nursery planted with currants, gooseberries, strawberries, &c., preparatory to planting out. The cultivation of vegetables is also being attended to.

SCHOOL OF HORTICULTURE.

In my last report I drew attention to the urgent need of establishing a Dominion school of horticulture. The question has again been brought up by fruitgrowers' associations and others, and it is hoped something will be done in connection with this important matter at an early date.

HOPS.

According to figures supplied by the Customs Department 1,946 cwt. of hops, valued at £14,903, were exported during the year. The following figures show the quantity and value of hops exported from the Dominion during the last five years ending 31st March: 1916, 4,425 cwt., £17,742; 1917, 4,449 cwt., £17,708; 1918, 2,134 cwt., £9,541; 1919, 2,294 cwt., £12,830; 1920, 1,946 cwt., £14,903.

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 comparison:—

	1919-20.		1918-19.	
	Quantity.	Value.	Quantity.	Value.
Fruit, fresh, dutiable	1,891,017 lb.	£ 33,972	1,381,061 lb.	£ 20,249
„ „ free	19,039,317 lb.	150,207	18,808,525 lb.	135,464
„ bottled and preserved	64,630 doz.	38,225	147,380 doz.	59,821
„ dried	9,450,103 lb.	311,312	8,070,001 lb.	221,105
Lemon and orange peel in brine	132,433 lb.	2,486	115,626 lb.	2,100
Fruit pulp and partially preserved fruit	195,042 lb.	3,679	67,686 lb.	1,532
Totals	..	539,881	..	440,271

INSPECTION OF IMPORTED FRUIT, PLANTS, AND VEGETABLES.

The examination of all fruit, plants, vegetables, &c., imported into the Dominion during the year has been carefully carried out at the ports of entry—Auckland, Wellington, Christchurch, Dunedin, and Bluff. The Fruit Inspectors report that the bulk of the consignments arrived in good order and condition. It was found necessary to destroy a number of lines for fruit-fly infection, and a fairly considerable quantity of fruit affected with live scale and mealy bug had to be fumigated before being allowed to land. A good deal of the fruit from the Cook Islands was found to be in bad order on arrival. This is attributed to a large extent to the unsuitability of the boat at present employed in the Island fruit-trade. An improvement is noticeable in the quality of bananas received from Fiji. Oranges and mandarins from Australia varied considerably in quality. Canadian apples arrived in first-class condition.

The following is a summary of all fruit, vegetables, plants, &c., examined at the different ports of inspection for the year ended 31st March, 1920 :—

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 ..	365,171	296	4,942	25	22,641	33	..	387,812
Wellington ..	84,426	1,143	461	..	22,762	..	..	107,188
Christchurch ..	24,616	214	..	..	7,721	2	..	32,337
Dunedin ..	4,288	92	50	..	7,145	1	..	11,433
Bluff ..	1,877	16	..	..	769	..	..	2,646

VINEYARDS AND VINEHOUSES

The area under vineyards still stands at 454 acres. The season was a favourable one, and as a result a good grape crop was harvested, being considerably in excess of that of the previous year, when unfavourable weather conditions were experienced. It is estimated the yield of wine will be 60,000 gallons, which, at a conservative estimate of 6s. per gallon, represents a value of £18,000.

The number of glasshouses in the Dominion is 871, being an increase of twenty-one on the previous year's figures. The yield of fruit was up to expectations and prices good. The crop under glass is estimated at 528,779 lb., which, at 1s. 3d. per pound, has a value of £33,049. A number of returned soldiers have taken up the cultivation of grapes and tomatoes under glass as a means of livelihood, and every assistance is being given them by the Division in the way of practical advice and printed information.

BEEKEEPING INDUSTRY.

The demand for information and instruction in beekeeping has increased to a considerable extent, and the Apiary Instructors have been kept busy during the year attending to the numerous requests in this direction as well as their other miscellaneous duties. Numerous lectures and demonstrations have been given by the Instructors during the year, including a number given at the various training-farms for soldiers. The attendances have been good, and keen interest taken in the proceedings.

In the Wellington, Canterbury, Otago, and Southland districts the honey crop has been a good average one. The past season in the Auckland District, however, has been the worst experienced for some years. This was due to the exceptionally dry weather in the spring and early summer. Although the reports on the London market show rather a dull demand for honey, it is considered the prospects are still good, and the return should be satisfactory for some time to come.

Although one or two additional Inspectors were appointed during the year, further assistance is still urgently required to deal with the proper inspection of apiaries for disease, particularly foul-brood, which requires close systematic inspection to keep it under control.

Experimental work has been continued at the Ruakura and Tauranga Apiaries. Some interesting tests were carried out with aluminium comb-foundation, which promises to be of considerable value to the beekeeping industry, more particularly by facilitating the extraction of thick honey. These experiments will be continued next season.

Certificates in Beekeeping.—The demand for instruction in commercial beekeeping at the Ruakura Apiary still continues strong. Some forty-seven cadets attended last season, and of these thirty-seven duly passed the examination and gained the Department's certificate of proficiency. The classes have a very capable instructor in Mr. Trythall, the Beekeeper in charge of the apiary.

Queen-rearing Apiary, Tauranga.—This apiary is now well established, and considerable progress is being made in the work of queen-rearing, &c. During the year 459 queens were sold, comprising 346 untested, 59 tested, and 54 selected queens. The present strength of the apiary is 65 full colonies and 159 nuclei, or 244 in all. Of at least 129 laying-queens, 58 are of known purity and the bulk untested. The honey-house has now been completed, and is a valuable addition to the apiary.

Avonhead Farm Apiary.—This apiary, consisting of forty colonies, was started for the instruction of returned soldiers in October last. Mr. L. Hight was appointed Beekeeper in charge, and has been kept busy raising queens, making up new hives, and keeping the site in order. Different makes of hives are being tested, and experiments carried out dealing with South Island conditions.

Export of Honey.—According to figures obtained from the Customs Department, 9,975 cwt. of honey, valued at £34,141, was exported during the year. This represents a considerable increase on last year's figures. The following figures show the quantity and value of honey exported from the Dominion during the last five years ending 31st March : 1916, 2,390 cwt., £6,067 ; 1917, 1,572 cwt., £3,554 ; 1918, 2,819 cwt., £7,991 ; 1919, 6,619 cwt., £32,018 ; 1920, 9,975 cwt., £34,141. The bulk of the honey graded for export was of prime quality. A few lines had to be rejected on account of fermentation, rusty tins, and unsuitable cases.

Registration of Apiaries.—There are some 6,392 persons, representing a total of 69,877 hives, registered to date. The triennial registration of all apiaries from one hive upwards takes place in the current June (1920). Full publicity is being given to the requirements of the regulations, and it is hoped that any persons who previously failed to register will see that the matter is attended to without fail.

STAFF.

In concluding this report I would mention that all officers attached to the Division have by close attention to their respective duties greatly assisted in the carrying-out of the various activities dealt with by this branch of the Department.

FIELDS INSTRUCTION AND EXPERIMENTAL-FARMS BRANCH.

INTRODUCTION BY THE DIRECTOR-GENERAL.

During the year active work has been carried out by the officers engaged in this service. Inquiries have been made with a view to endeavouring to find a thoroughly capable and in every way suitable man to take charge of the branch, but no appointment has yet been feasible. Meanwhile the control and direction of the work has been in the hands of myself, aided to a very large extent by Mr. B. C. Aston, Mr. A. H. Cockayne, and Mr. J. L. Bruce. Mr. Aston has handled the bulk of the correspondence, and in collaboration with myself has exercised such direction as was necessary, while all details of the work to be carried out by the various officers have been dealt with by him, Mr. Cockayne, and myself in conjunction. In the case of the larger experimental farms Mr. Bruce has superintended the whole of the work, being in close collaboration with myself.

C. J. REAKES.

EXPERIMENTAL FARMS.

Ruakura Farm of Instruction, Hamilton.

The Ruakura Farm has still further developed as an instructional centre, and though the expenditure on the place has been very considerable during the year its value from an instructional point of view and from the standpoint of the development of agriculture must be admitted to have been very great. Quite apart from such instructional work, the number of farmers and others who visit the farm for the purpose of obtaining information is still increasing, these including not only people from all parts of the Dominion, but many from outside countries.

An important feature of the work done on this farm is that in connection with returned soldiers, who are given a four-months course of instruction in various farm occupations of a lighter nature, this place being reserved especially for men who through wounds, sickness, or other causes are unfitted for the more laborious types of agricultural work. The quarters provided are always full, and the average number of soldiers on the place is about thirty. As it is, the existing accommodation is quite inadequate for the number of applications received for admittance to the instructional courses, and consequently additional quarters are being erected by the Repatriation Department. Apart from the training of returned soldiers, more and more instructional classes are being held annually for the benefit of farmers, school-teachers, and scholars. During the year members of fifteen branches of the Farmers' Union held field-days at the farm, and the annual teachers' course was carried out. In addition, special days were set aside for visits of inspection by members of various breed societies. A very successful farm school was held in July last, this being attended by upwards of seventy farmers.

As regards the agricultural work, good progress has been made each year, bringing the land into a higher state of cultivation. For the past few years much work has been done in bringing into profitable use land previously consisting of waste sorrel areas, these being converted into good temporary pastures. From now on it will be possible to devote more attention to rotation cropping, also to breaking up some of the older pastures. Good crops of oats, wheat, barley, and rye-corn were harvested during the year, but the hay crops were light owing to the dry spell in early summer. Some of the root crops were exceptionally heavy, the seed of these having been grown on the farm and saved from selected roots only, uniform in shape, sound and vigorous in growth. A comparison with other root crops grown in the same field from purchased seed and given exactly the same treatment as regards cultivation, &c., afforded an excellent object-lesson, the yield in the latter case being much smaller.

The whole of the Department's Milking Shorthorn stock are now located at Ruakura, those previously at Weraroa having been transferred early in the year. The Berkshire pigs are doing well, and by careful selection and heavy culling the Ruakura pig-stock is reaching a high standard, and is coming into demand from prominent breeders throughout the Dominion. During the year a calf-feeding experiment, mainly with a view to ascertaining to what extent milk or whey could be profitably eliminated from the dietary by the substitution of other foods (largely farm-grown), was carried out with successful results.

In the horticultural section of the farm a considerable amount of test work has been done in connection with spraying, pruning, &c. The garden work was carried on successfully, and was greatly appreciated by those returned soldiers on the farm who were specially desirous of receiving instruction in horticulture.

The apiary section is still expanding, and during the year forty-four persons received training, these comprising twenty-nine returned soldiers, six returned nurses, and eight other ladies. Queen-rearing operations were actively carried on during the season, and considerable sales were made of full colonies and nuclei, all headed by choice-bred queens. The whole were supplied to returned soldiers and former learners. Experimental work was continued on various lines. The apiary is also becoming more self-contained every year in the matter of making its own appliances.

In reference to the expenditure, much of this has been in the direction of improvements, one important item being the erection of a new piggery.

A new system of farm accounts and costing has been initiated, and appears to be working satisfactorily.

Mr. A. W. Green, the Farm Manager, has done excellent work throughout, and has been well backed up by the officers associated with him.

Central Development Farm, Weraroa.

Farming operations for the season mainly consisted of comprehensive variety tests of root crops, trials of fodder crops for hay purposes, trials to ascertain the effect of certain economical field crops for weed-smothering, trials of oats and tares for hay to replace the usual grass-hay, variety tests of

oat and potato crops, and manurial tests of mangolds. In addition, the usual crops of barley, linseed, rye, maize, and white turnips were grown for farm purposes. Eleven acres of lucerne were sown about the middle of November last, also a further three acres in the autumn. It is considered that lucerne should replace much of the maize specially grown in this district by dairy-farmers to tide over the usual dry months of December, January, and February. To effect the better cultivation of fields generally a system of rotational cropping has been initiated, and it is anticipated the results will demonstrate to farmers generally the value of systematic methods.

Owing to the condition of practically the whole of the boundary and divisional fencing it has been necessary to completely renew the same. The greater portion of this work has been completed; totalling over eight miles. It was, fortunately, not necessary to purchase any new wire, which, at the present high values ruling, was a very great saving. During the year the scheme for connecting the farm with the Levin high-pressure water-service was completed, and fills a long-felt want.

The three breeds of dairy-cattle—Friesian, Red Poll, and Guernsey—kept on the farm are maintaining their reputations. The Red Polls have this year proved satisfactory milk-producers, and have well justified the term of “dual-purpose cattle.” All purebred Shorthorn cattle were transferred to Ruakura during the year. The usual spring clearance sale of young stud bulls (together with certain female Friesian cattle) was held in October, the prices realized being very satisfactory, one yearling Red Poll bull bringing 120 guineas.

Calf-feeding experiments were carried out on the same lines as at Ruakura, and all the test calves are being carried through winter in order to watch the effect of the different methods of feeding, if any, on the constitutions of these young animals. It is intended during the coming season to carry out certain experiments in depasturing pigs, in order, if possible, to eliminate feeding by-products of the dairy. With this end in view six acres of land have been ploughed, and certain portions have already been sown in lucerne and crimson clover. It is hoped to make a start with this grazing system about next July or August. It is intended to introduce Tamworth-Berkshire crosses, and with this end in view a purebred Tamworth boar has been purchased.

The number of farmers visiting the farm has greatly increased. Apart from individual visitors, two large gatherings representative of branches of the Farmers' Union were held on the farm in the form of field-days.

The training of discharged soldiers has been effectively undertaken at this station. Accommodation is provided for twenty-four men, and a systematic course of training in practical farming has been carried out. In addition lectures embracing agricultural subjects were given during the four-monthly course of tuition.

The present Farm Manager, Mr. W. J. McCulloch, took charge in July last, and with the loyal co-operation of the farm staff has done much good work for the farm under somewhat difficult conditions.

Moumahaki Experimental Farm, Waverley.

Lack of efficient labour retarded general operations, nevertheless useful demonstration work has been accomplished. A judicious system of cropping, whereby the land is enabled to feed a greater number of cattle and sheep, together with the laying-down of good pasture and reasonable attention to same, has been continued as a strong feature. Top-dressing pastures with various fertilizers and the renovation of old clover on old pasture are under test. Among other operations, a field of 6 acres is in course of preparation for depasturing pigs during next season.

Despite the unfavourable spring weather fine crops were grown. Rape and peas provided excellent forage for lambs, and store lambs are being fed on good crops of turnips and swedes. Mangolds though somewhat patchy, will yield well, and carrots are a very good crop. Peas proved an excellent crop, but owing to rain some difficulty was experienced in harvesting. Oats and barley were secured in good condition, the area in cereals being limited as compared with previous years. Owing to the dry spring, potatoes were a light crop; the quality is, however, very good.

The health of live-stock has been good, and sales of fat stock exceeded those of the previous year. The herd of Ayrshire cattle continues to hold its place, and has secured awards wherever exhibited. The flock of Ryeland sheep is increasing, and all rams for sale meet with a ready market. All the Berkshire pigs bred are easily disposed of. New piggeries on a good practical plan have been erected. These will supply a long-felt want, greatly facilitating work and effecting economy in feeding.

During the year the farm has continued under the efficient management of Mr. T. W. Lonsdale.

INSTRUCTIONAL WORK, AND LESSER EXPERIMENTAL AREAS.

The work of the fields instructional staff in the various districts is carried out principally on the following lines: Investigational and demonstrational work on selected areas; advice and instruction to farmers regarding soils, manures, pastures, and field-crops in general; lectures, practical demonstrations, and field talks; fertilizer control; collection of soil-samples for analysis; collection of limestone and lime-samples for analysis and report.

The following information is furnished by officers in charge of instructional work in each district:—

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

Under the recent scheme of reorganization the work of fields instruction to farmers in the Auckland Province was placed under my charge in November last.

Investigation and Demonstration.—Experimental areas are in operation at Albany and at Puwera (near Whangarei). The chief investigation that has been attempted at Puwera is a set of experiments the aim of which is to find the best and most economic method of establishing permanent pasture of the best possible type on poor gum-lands. Trials are also in progress for the growing of suitable and profitable supplementary fodder crops. In so short a period one cannot generalize with any degree of certainty; however, present knowledge indicates that drainage, preliminary long fallow, liming, and deep cultivation, including subsoiling, are effective means of soil-treatment preparatory to cropping. Subsoiling, both at Albany and Puwera, has proved so useful an operation in securing better crops of roots, including turnips, swedes, and mangolds, that other trials are being carried on for further

testing the value of subsoiling. Much local interest in now being taken in both these areas by bodies of farmers and others. The Whangarei High School students taking agricultural courses are conducted over the Puwera plots periodically and shown what is being done.

Other than the areas at Puwera, Albany, Motuihi Island, and the co-operative experiments at Dargaville (the latter carried out in conjunction with the Auckland Education Board), no further investigational work has been attempted, as the present staff could not cope with it. The need for an extension of field experiments, covering the great diversity of soils and other conditions in the province, is, however, very great.

Advice and Instruction.—This is given either on the farm personally or in the office to callers, or over the telephone to inquirers, or by letter. The advantages of giving advice in regard to soils, pastures, and crops personally on the farm are obvious, though it entails much more time and expense in travelling. The farmers thoroughly appreciate this method, which has proved the most satisfactory. Callers at the office average two or three a day, and are increasing. The small herbarium of economic plant-specimens that I am setting up, as also a reference library and other instructional aids, will be of practical value in this connection. A range of soil-samples from typical areas in the province, with analyses attached, as also a range of manurial samples set up similarly, should prove useful for reference.

Lectures and practical demonstrations have been delivered to the branches of the Farmers' Union in the Northern Wairoa and Kaipara districts; to members of the settlers' associations at Waihi and Aria respectively; and to dairy-association members at Piopio; also series of lectures to soldier trainees at Ruakura Farm and Motuihi Island, and cadets, teachers, and farmers at the schools held at Ruakura. The subjects covered have been chiefly soils, manures, crops and cropping, and lime and liming—all dealt with, particularly to farmers, in a practical rather than an academic way. Several ensilage-stack-building demonstrations have been given, Mr. Dibble's special knowledge in this proving of great value.

On selected farms neighbouring farmers have met the Instructor, and, while being conducted over the farm, pastures and crops were examined, unknown plants identified, and their useful and other characters discussed. Instruction of a very practical nature has been accomplished in this way. Farmers appreciate this more than instruction within the four walls of a room.

Fertilizer Control.—Regularly samples of fertilizers on the market are taken under the Fertilizers Act, and sent for analysis to the Chemist at Wellington. The greatest menace to high production at present is the scarcity of fertilizers, especially phosphates, and the very high prices charged.

Lime and Limestone.—Since analyses have shown that lime is very necessary in most of the soils of this province, and deposits of limestone rock being well distributed, farmers are sending samples of stone from various parts for analysis. We have sent many samples forward to the Chemist. His reports show that deposits are found varying in carbonate-of-lime content within the limits of 40 to about 90 per cent. Some farmers are considering installing small crushing plants on their farms where deposits are found, to supply their own agricultural lime. Liming as a regular farming practice is growing in favour, and shows, as one would expect, good results.

Seed-control.—There is, unfortunately, no Pure Seeds Act on the statute-book, and the necessity for one is indicated by the fact that tests have shown in some cases recently no germination whatever or entirely low percentages. We collect samples and send them on to the Biologist for testing. Advantage is taken of this free service by farmers and others.

Control of Plant-diseases and Insect Pests.—I have noted flag-smut in oats, rust in various cereals, and other fungoid diseases in field crops when on my usual itinerant duties. We advise farmers, as also when insect pests are noticed, and give information on preventive or remedial treatment, or both, when and where necessary. If it is a matter of some unknown trouble, affected specimens of plants (or, in the case of insects, specimens of the insect itself) are sent to the Biologist for investigation and report. On the whole, the province is fairly free from disease of a serious nature in regard to field crops and pasture. Ergot, particularly in tall fescue and rye-grass, and rust in cereals and some of the grasses such as meadow-fescue, are the only outstanding cases of plant-disease we have noted in this province. Rhizoctonia I have noted in one lucerne crop, also in a crop of Early Puritan potatoes.

Weather.—The spring was unusually dry, and crops and pasture suffered in many parts. Late frosts in the first week of December caused much damage and consequent loss, with potato and maize crops chiefly. However, some farmers who put in millets, sorghums, and similar crops for green feed had fodder for dairy stock, and were not so badly affected by the dry spring and summer. In the New Year copious rains fell, and the autumn proved a good one, with the consequence that abundant pasture and stock feed was assured for the oncoming winter.

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

Weather.—The year has been a peculiar one as regards weather. The winter and spring were cold with incessant high winds, and nothing like the normal rainfall. The six months ending 31st December, 1919, showed a shortage of from 30 to 50 per cent. according to locality, and in parts of Hawke's Bay and Gisborne it was even greater. With the New Year the weather broke and the rainfall for the last quarter was considerably above normal, and has to a great extent made up for the deficiency in the spring. The exceptions are the low country about Gisborne and central Hawke's Bay. In these latter localities there was very little rain until the last week in March, when a fairly good downfall was experienced. From a dairying point of view the spring was bad, but the autumn has been one of the best on record.

Crops.—The area in wheat was less than last year. The yield was much about the same, but considerable difficulty was experienced in saving it, consequently some of the grain was not of the best quality. The oat crops are much about average on the west coast, but very light in Hawke's Bay. Very little barley was grown, but the yield was fair.

The area under soft turnips was greater than last year, and on the whole the crop has been much better. The swede area is about normal this year, and the crops on the whole are good and in many cases very fine. Considerable difficulty was experienced in getting a strike, and many settlers had to

resow, but this was probably more owing to bad weather conditions than to bad seed. With the exception of a few corners, the aphid and moth have not been bad. Club-root and root-rot have again been prevalent in the Brassica crops, more especially in swedes. The area of mangolds is greater than last year, and on the whole the crop promises to be a good one. As was the case last year, many farmers had to resow. The area of kales is about the same, and the season has been better for second growth. As usual, the early-sown rape crop was patchy, but the main crop was very good except in central Hawke's Bay.

In Hawke's Bay and Gisborne a fair area of field-pumpkins is grown, but the season has been too dry and the crop is light. On the west coast the season has not been suitable, and very few pumpkins are to be seen.

Lucerne: This crop has done well, especially from December on. The March growth was exceptionally good, which shows that even on this west coast lucerne will do better with frequent showers during the warm period. As was the case last year, the early-sown areas are patchy, but where the sowing was delayed until the early part of December the takes have been good. From the number of requests for advice and general interest shown I think that the area sown will show a considerable increase; especially is this the case in the Hawke's Bay and Gisborne districts. In both these districts lucerne does well over a considerable area; and when one considers the condition of a great deal of valuable stock, and the numbers that have died during the last two years for want of food, one wonders if it would not be a fair thing to prosecute many settlers for criminal neglect. The amount of seed sold by leading seedsmen on this west coast (including Taranaki) was 19,396 lb., against 22,845 lb. last year. In Hawke's Bay leading firms sold 16,293 lb., and in Gisborne 18,659 lb. In addition to these quantities large supplies are procured by growers direct from Wellington, Blenheim, and Christchurch.

The early hay crop was very light, but was saved under fair conditions. The later crops were much heavier, but as the weather was broken many of them were saved in indifferent condition, and some, particularly oat-hay crops, were so badly knocked about as not to be worth saving. I am pleased to say that good stacks of hay are noticeable this year in districts where in former years none were to be seen.

The area in maize in Hawke's Bay and Poverty Bay is much about the same as usual, and at present the yield promises to be fair. On the west coast the area is much the same, and the weight of green stuff very much better than usual. As there has been an abnormal growth of grass during the autumn a great deal of the maize is not required for green feed (for which purpose it was grown), and many farmers talk of making it into ensilage. Generally, however, they are afraid of the labour entailed. As regards ensilage in general, from the small number of stacks seen and the limited number of inquiries received it does not appear to be gaining very rapidly in favour—the labour question, as indicated, being the great bogey. Japanese millet is still grown for green feeding, and has done well this year. Where tried Sudan grass has also done well.

The potato area is much about the same as last year. The early crop was good and healthy, being free from blight. Owing to the moist conditions since the New Year the main crop has suffered rather badly from blight, and although the tubers were fairly well grown before the blight made its appearance it is found on digging that many of the tubers quickly rot. In Hawke's Bay the crop is light but fairly sound. Very little spraying is done.

Crops of rye-grass and crested dogstail were much better than last year. Cocksfoot was fair, but not a great deal was saved.

Seeds.—There have been a lot of complaints about bad germination, a great deal of which is traceable to badly prepared seed-beds and unfavourable weather conditions. At the same time the popular lines of seed have been very mixed, and in some cases the germination has been low.

Pastures.—At the time of writing (end of April) the pastures are good all along the west coast and through the Hawke's Bay side as far as Dannevirke; from there on north-west they get poorer, and after passing Waipukurau they are very bare. The same applies to the lower country in the Gisborne district.

Winter Feed generally.—As previously mentioned, the root crops are good along the west coast, and although the hay crop was light a larger area was saved. This, coupled with the good autumn growth, makes the winter prospects bright. On the east coast there are very few root crops, and what there are are very poor. There was practically no hay crop to save, and although sheep will get through fairly well cattle are going to have a hard time in many instances.

Field Competitions.—These continue of interest, and two new competitions were started during the year. As mentioned last year, I think these competitions are worthy of the Department's support.

Fertilizers.—These show a steady increase in value and, what is worse, they are difficult to procure, farmers being frequently forced to wait a considerable time and then accept anything offering. Shipments of Ephos phosphate have helped, and there has also been a little basic slag offering, but with the exception of one consignment of 18 per cent. it has been of low grade. Two or three shipments of high-grade slag are expected shortly, but these will show a considerable increase on last year's prices. A few samples of fertilizers have been taken for analysis, and one prosecution is pending. It is hoped to take more samples during the coming year.

Lime.—This is being more and more used, and practically all obtainable is being applied. During the year representative samples of soil were collected for analysis to ascertain the lime-requirement, and they have shown deficiencies from 14 cwt. to 8.2 tons per acre. A number of applications are still waiting, and will be attended to as fast as the samples can be dealt with by the Chemical Laboratory.

Experimental Work.—This has been confined to the Stratford, Waimate West, Marton, Rawhiti, and Waipukurau areas.

Stratford Model Dairy Farm: The experiments on this farm are more or less a continuation of last year's work. One new feature is the growing of special ensilage crops. These consisted of wheat, oats, and barley in conjunction with tares and peas, and the results will be of considerable interest to the district. From an area of about 8 acres approximately 100 tons of green material were made into an ensilage stack. As details of experiments are published from time to time it is

not necessary to repeat them here. Since last report a further 20 acres has been stumped, part of which is in root crops, and these latter promise to be the best grown on the farm. The policy of developing the farm as fast as income will permit has been continued.

Waimate West Demonstration Area : This area was taken over on 1st April, 1919, and a start made to get improvements effected. Owing to the scarcity of labour, the railway traffic cut, &c., this was a very difficult proposition. However, the farm was divided into ten paddocks, a house, cowshed, and outbuildings erected, a herd of forty-eight grade Jersey cows and heifers procured, and milking started in August. The experiments have consisted in the top-dressing of 36 acres with different mixtures, and the growing of 8 acres of various root and fodder crops. These crops have been universally good, but have entailed a lot of work in the way of weeding, the land being full of fumitory, wild turnip, and *Poa pratensis*. This 8 acres is intended for lucerne, and it is necessary to give it special attention.

Marton Experimental Area : The season was very unfavourable for spring-sown crops, the land being cold and slow to warm up. There are also parts badly in need of drainage, and this will have to be attended to before the results from portion of the area will be satisfactory. Then, in the autumn, owing to the continued wet weather, great difficulty was experienced in saving crops. The crops grown this year consist of 9 acres of Algerian oats, 1½ acres Ruakura oats, 9 acres wheat (six varieties), 8½ acres barley (two varieties), 11 acres peas (five varieties), 1½ acres millets (eight varieties), 1 acre potatoes (three varieties), 8 acres roots, kales, and rape (several varieties of each), 5 acres of rye and clover cut for hay, and 2 acres of lucerne. The crops, with the exception of the oats which were in a cropped-out paddock, have done well. The wheats ran from 29 to 56 bushels per acre, and averaged 40 bushels per acre for the 9 acres. In the lucerne area an acre of the Grimm variety has been established. Portions of this Marton area are very badly infested with weeds, particularly spurrey, red-shank, and *Agrostis stolonifera*.

Rawhiti Area (Hawke's Bay) : The work on this area has consisted in sowing down 8 acres in a special grass mixture, half in the spring and half in the autumn, 6 acres in soft turnips (four varieties), and 8 acres in swedes (four varieties). It is proposed to sow the latter 14 acres in different permanent grass mixtures next season. The season in Hawke's Bay has been very unfavourable for root crops, and it was very hard to get them started, consequently the crop is patchy, but has made fair growth since the New Year. The lucerne plot of 4 acres sown last year still shows plenty of plants, but has made little or no growth.

Waipukurau top-dressing experiment : As the owner of this land wished to plough up the untreated area, the experiment was discontinued as from the 1st January last. During the two and a half years the experiment has been going it has demonstrated the advantages of top-dressing, but it is a pity it could not have been continued on more definite lines and with different mixtures. This is another example of the undesirability of carrying out experiments on land over which the Department has not complete control.

Lectures and Correspondence.—During the year I have given addresses at different centres on the following subjects : Lucerne-growing, root and fodder crops, laying down and care of pastures, lime and manures, and ensilage-making, and the requests in this direction are on the increase. Letters asking for advice are also on the increase, and take up a lot of time.

Wellington (except north-western districts), Marlborough, and Nelson : F. E. Ward, Instructor in Agriculture, Wellington.

Since my appointment in January, 1920, inquiries on agricultural matters addressed to the Department's head office have been attended to by me, and where necessary farms visited and advice given.

During the months of February and March a number of branches of the New Zealand Farmers' Union in the Wairarapa and Manawatu districts were addressed on agricultural subjects. The Masterton Agricultural and Pastoral Association has set up a special committee to confer with the district Instructor as to how the Department can further assist the farming community, and useful work will doubtless develop in this direction.

Weekly lectures on such subjects as soils, manures, crop-growing, and pastures have been given to the returned soldiers receiving training at the Central Development Farm, Weraroa, the Wairarapa Training-farm, Masterton, and the Training-farm, Tauherinikau.

Canterbury and North Otago : A. Macpherson, Fields Instructor, Christchurch.

Weather.—The year has been remarkable for its abnormal weather conditions—its very cold spring and the frequent snowstorms, especially on the inland plains, which have characterized every month from April up to December inclusive, the last fall occurring on 8th December, when up to 3 in. were recorded on the western portion of the plain. In the middle of January snow covered South Canterbury, but the fall was slight in North Canterbury. At this time the harvesting prospects were very doubtful, and the position might have become acute but for the beautiful spell of weather that ruled almost continuously from the middle of December to the middle of March last. As it turned out, the harvest was somewhat delayed, especially in South Canterbury and Otago, but to no serious extent. Frosts have been frequent and at times severe. It was remarkable that the severest frosty spells occurred at the end of May and the beginning of September, not during June, July, or August, as would be expected in a normal season. The extent of damage done by frost proved to be slight compared with estimates of farmers, but the April and May frosts damaged undug potatoes. An unusual feature of the autumn and winter of 1919 was the somewhat marked prevalence of high north-west winds, a wind which is normally associated with spring and summer in this province. As a consequence the winter was an alternation of unseasonably mild weather and more seasonable cold spells, when southerly changes occurred. Only slight damage, however, appears to have been done through the premature budding of plants. Moderately heavy snowfalls occurred on 22nd June, and from 1st to 4th July inclusive, but were soon dissipated by succeeding heavy north-west winds and rain following, so could not be considered serious in their effects. The heaviest falls occurred in the spring months, especially during September and November, and occasioned serious losses to sheep-owners. The year ended with a rainfall which approximated, over most parts of the Canterbury

Province, the average annual precipitation. A narrow coastal strip which includes Christchurch recorded a rainfall some 2 in. below the annual average. In North Otago the rainfall for the year was slightly more than in Canterbury.

Pastures.—The condition of the pastures generally is capable of great improvement. Large areas, quite 75 per cent. of the land returned as in English grasses, are completely run out, this applying equally to Canterbury and North Otago. Statistics show that for quite twenty-five years, in neither of these has the stock-carrying capacity of the pasture lands increased, although during that period there has been a considerable increase in the area under that head, and large properties have been cut up and considerable land-settlement effected. This condition of the pastures is mainly attributable to (1) The sowing of unsuitable mixtures of grasses; (2) not consolidating the seed-bed before sowing the seed, and not covering the seed sufficiently after sowing; (3) stocking when the first growth is only a few inches high, and continuing this process of eating off the growth when a few inches high at short intervals, thereby stunting the plant by not allowing the root portion to develop properly during the first year of its growth, which has a prejudicial effect on it afterwards; (4) the too common practice of sowing pasture grasses for catch-crops or annual and biennial pastures only, instead of sowing pasture grasses, clover, and deep-rooted forage plants which form more permanent pastures; (5) the exhausting of the humus in the soils by too frequent white crops being taken, also by the frequent open fallowing and working of the soil in dry periods; (6) the sowing of inferior seeds. Pastures at the close of the year under review in North Canterbury and mid-Canterbury are probably in better condition than usual, owing to a better distributed rainfall. In South Canterbury and North Otago they are not so good, through want of sufficient rain during March.

Crops.—Cereals: Wheat-growing generally has been successful, and in some cases the yields have been quite beyond expectations. Cases of yields up to 89 bushels per acre have been reported. North Otago wheat crops are very good. There was an absence of rust and smut, but the disease known as "take-all" did some damage in a restricted area; it is not considered, however, the total yield for the district was materially affected by this cause. Mr. R. Waters, of the Biological Laboratory, visited the affected districts and investigated the disease on the spot. The promptitude with which the Department handled this matter has been most favourably commented upon by growers. In regard to oats, the quality of the grain is good, but the yields are approximately 10 bushels per acre under last year's. Very little rust or smut was in evidence this season. Some damage was done to barley by caterpillars in the Ellesmere districts, but the barley crops on the whole have given a bountiful return. Reports of yields up to 93 bushels per acre have been published, and prices have been in the vicinity of 9s. per bushel. There is an apparent shortage of this cereal.

Root crops: In selected spots some fair turnip crops have been obtained, but generally throughout the district the returns are small, and in many cases the cost of growing turnips is not recouped by the amount of feed obtained. Swedes are badly blighted in most districts. Mangold crops are good this season, but most farmers find it an expensive crop to grow.

Forage crops: The returns from rape and kale have been disappointing. It is now admitted by most progressive farmers that the growing of rape or kale is anything but a paying proposition in Canterbury, where, owing to the climatic conditions only one passable crop in seven years is the average.

Potatoes: There appears to be a greatly increased area in potatoes this year. During a short spell of damp, warm weather in February blight made its appearance, but did not develop to any extent. Good yields are expected, but crops are late, and digging will not be general till the middle of May.

Lucerne: The past year has shown that the interest taken in this crop is an ever-increasing one. Many farmers have laid down areas in some cases up to 100 acres in extent. The unremunerative conditions of most Canterbury pastures, and the comparative failure of turnips and rape, have convinced many landholders that if the stock-carrying capacity is to be increased they must turn their attention to lucerne. Improper cultural methods have been responsible for many failures and partial failures during the year amongst would-be growers of lucerne. Investigation on an extensive scale was carried out during the past year in regard to many wrong and absurd ideas prevalent in regard to the growing of this plant. Matter is being prepared for publication dealing with these, accompanied by photographs.

Advice on Agricultural Matters.—The number of farmers and others calling at the office to seek advice has again shown a substantial increase. The past year has been a record one in the number of requests made both verbally and in writing for advice on matters appertaining to the various branches of agriculture. The work of attending to inquirers regarding lucerne-growing, and to the lucerne demonstration areas, has now become so heavy that it more than keeps one officer fully occupied. There have been many urgent requests to visit farms in various parts of the district to give practical advice on the spot. These requests have been attended to as far as time permitted, but there are at the end of the year a number of farms yet unvisited. It is not only amateur farmers who are seeking advice; many of the requests come from men who have been all their lives on the land, but who are impressed with the need of reform and the adoption of more up-to-date methods in the treatment of the soil, the growing of pastures and forage crops of a more reliable character, and the need of building up the humus-content of the soil. They are also struck with the lack of sufficiency of lime in most soils, and the indiscriminating use of artificial manures with all manner of soils and crops. This interest shown by many practical farmers may be looked upon as a keen awakening to the needs of a change in our methods, and that the efforts put forth by the Department in field-work in the past have not been in vain.

Lucerne Demonstration Areas.—It is too early to report on the results for the past year, which can only be dealt with when all the crops for the season have been secured. These demonstrations are fulfilling the purpose for which they were initiated, and are proving how poor lands can be brought to increase the production of the Dominion.

■ *Ashburton Experimental Farm.*—As usual, a special report is being prepared in connection with the operations and work carried out during the past year. It may be mentioned, however, that good payable crops of cereals have been secured, and that the lucerne demonstration area has

disclosed some valuable information in connection with the culture of this plant, which will have far-reaching and beneficial results bearing on this important question.

Displays at Shows.—There have been three of these during the year. The first was at the Agricultural and Pastoral Association's Show, at Leeston, during October. The next was a display of grain, &c., in the Colosseum, at Christchurch, during Industrial Week. This display was staged for eleven days and was much admired. A display was also made at the Canterbury Metropolitan Show, at Addington, in November last. A very busy time was experienced on all these occasions, and the demand for information was very great.

Middle and South Otago and Southland: R. P. Connell, Instructor in Agriculture, Dunedin.

Since taking up my duties in Otago and Southland in October last a considerable portion of my time has been devoted to the demonstration areas at Gore and Winton, the 1919 season's work for which had been planned previous to my appointment.

The Gore area is approximately 30 acres, and on it good crop results have been obtained this year. The most valuable section of the work is the swede-dry-rot investigation block, which is under the direction of the Biology Section, but turnip and oat variety trials, pasture demonstration work, origin of seed-oat investigation, and potato-culture, are all providing interesting results. The soil is making distinct response to the ameliorating practices which have been carried out during the current and previous seasons. Details of some of the crop-investigation results have already been submitted, but in most cases the harvesting has not been completed, and results are not yet available. Mr. R. L. Beaton, who is farm overseer, carries out his work very efficiently.

At Winton the major portion of the area has been under an oat crop, but there is also a swede-dry-rot investigation block similar to that at Gore. Extensive drainage has been done during 1919, and the beneficial effects of this work have been obvious. Indeed, on portions where good crops were grown it is doubtful whether, in view of the unfavourable season, a crop would have been harvested at all but for the improvement in the conditions due to the drainage. Mr. W. Campbell, the farm overseer, satisfactorily carries out his duties.

I have spent a considerable amount of time attending to inquiries from farmers. It is a significant aspect of this work that the bulk of the inquiries refer either to pastures or to methods of soil-management. These are features of farm practice in which there is much scope for improvement, and the fact that inquiries are frequently received in this connection shows that the farming community itself is not so satisfied with the methods now in general use as to be apathetic to other methods which may be deemed worthy of recommendation. Another pleasing feature of the work among the farmers is that the number of inquiries received in a given period is gradually increasing. As opportunity offers information is being gathered about the results of any special farm practice, and also about the details of the present farm practice, all of which knowledge is of special value in the work of planning the experimental work of the future. Matters which receive particular attention in this respect are irrigation in Central Otago, liming and the use of artificial fertilizers, and the establishment of pastures.

The boys' farm-competitions fostered by the Otago Expansion League were well advanced for last season, when I took up duties in the province. For the coming season I intend to work in conjunction with the League, with a view to extending the competitions and making them as instructive as possible.

To a limited extent I have been able to accompany Dr. L. Cockayne on his investigation of tussock-grassland problems, and this has given me the opportunity to become acquainted with the main features of his work and the lines on which he is proceeding.

Among the miscellaneous duties that have at times called for attention are the collection of fertilizer samples, and samples of soils for the determination of the lime-requirement, also reporting on crops.

Mr. W. Alexander, Fields Instructor, stationed at Invercargill, has very satisfactorily carried out the duties allotted to him.

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

Climatic conditions in this district from April to the end of December, 1919, were decidedly against farming operations and the carrying-out of work in progress on experimental areas, owing to the excessively wet weather, there being a rainfall of 77 in. in that period. Since then the conditions have been excellent—fine weather with occasional bursts of rain.

Another feature which militated against getting satisfactory work done on experimental areas was the scarcity of suitable labour; in fact, labour sufficiently skilled to do the work required cannot be procured on the Coast, and one has to make the best of whatever labour is available.

Cereal crops did well, and made a rapid growth during December. Turnip crops are at present looking healthy, although the braids were extremely poor in some districts, and resowing had to be resorted to in many instances.

During the year a number of farms were visited for the purpose of giving advice in the growing of suitable crops, laying down of pastures, and manurial treatment. Soil-samples for lime-requirement were taken and forwarded to the Chemist for analysis, the results being communicated to the farmers. All samples forwarded show that heavy dressings of lime are required.

In company with Mr. A. Macpherson, Fields Instructor, of Christchurch, a visit of inspection was paid to the Grey Valley district last August, for the purpose of selecting an area for an experimental farm. An area of 150 acres was selected at Waimaunga.

Experimental Areas.—Hokitika: Of this area 6 acres were in turnips and 7 acres in lucerne. The turnips, although sown late (February, 1919), made very good growth. The area has since been sown down in grass, and is carrying good feed at present. The lucerne has done poorly, and 4 acres of same has been resown with grass.

Moana: This area has been leased for grazing purposes during the year. Grass mixtures sown in February, 1919, have made favourable progress.

Rotomanu: This area was ploughed in the spring, and sown in swede manurial and variety tests at the end of December, weather conditions delaying the sowing until this date. Three plots of

Magnum Bonum variety failed to make a satisfactory braird. Imperial Green Globe turnips were then sown, but these failed to strike. The other seven plots made a good growth, but after thinning was completed the common cutworm did considerable damage.

Poerua: This area was sown in permanent pasture, and no further experiments will be carried out.

Westport: The Westport grassing-area of 2 acres was sown in two grass mixtures of half an acre each, and one acre in ten individual grasses. The grass mixtures have done excellently, but the individual grass plots suffered from a strong growth of weeds, principally spurrey and redshank. The area at Sergeant's Hill was abandoned, and the fencing-material removed and used for the Westport grassing-area.

Murchison: The fernland grassing-area at Murchison has been well stocked with sheep during the season, and at present is closely fed down. Sheep show a decided liking for the No. 4 plot, in which *Poa pratensis* is the dominating grass.

Drainage of bush-terrace land: Drainage by explosives was tried on this class of land by driving a bar down to depths of from 5 ft. to 8 ft. and then putting in a strong charge of explosive, but results were not effectual. Shafts were sunk to a depth of 9 ft. and 11 ft., and good drainage was obtained in this way.

GENERAL.

The economic investigation of the montane tussock-grassland conducted by Dr. L. Cockayne, F.R.S., as outlined in last year's report, has been continued during the period under review. Many data of a valuable nature have been obtained and the most important features published in the *Journal*.

During the year the matter of an experimental farm for the West Coast District of the South Island was definitely advanced by the purchase of an area of 150 acres near Waimaunga Railway-station, Grey Valley. Measures to develop the area are now being put in hand.

CHEMISTRY SECTION.

REPORT OF THE CHEMIST.

The Director-General.

Wellington, 17th June, 1920.

I FORWARD herewith the annual report of the Chemistry Section for the year ended 31st March, 1920.

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

INTRODUCTORY.

During the year there has been an increase in the amount of work done in the Chemical Laboratory. As a temporary measure since 20th October, 1919, the supervision and administration of the fields instruction work, in collaboration with the Director-General, has been added to the Chemist's personal duties. He has also been responsible for the work of the departmental library during the year under review.

SOILS.

The general work of soil-investigation has been continued as time and staff permitted. Samples of soils from different parts of the Dominion have been collected from time to time, and the investigation of these samples has gone on continuously during the period; 156 soils were collected (for analysis) by the Chemist and staff, and 214 were collected (for lime-requirement tests) by field officers.

In June of last year it was decided, in view of the great value of lime as an improver of New Zealand soils, that steps should be taken to bring home to farmers the necessity for liberally liming their lands in order to obtain the best results. The Fields Instructors and their staff were therefore notified to collect typical samples of soil from their districts, and to select the samples in such a way that the tests would result in the greatest good to the greatest number of farmers. They were instructed to collect few samples of a representative character rather than a large number of samples which might represent only limited areas. The results of this work, so far as it has gone, are being published in the *Journal*.

Early in May, 1919, the Chemist visited the Te Teko district, the Mamaku Experimental Farm, and the Ruakura Farm of Instruction, and in the course of the trip took a number of samples. In February, 1920, he visited Dunedin and collected representative Otago Peninsula soils for analysis and study. The Canterbury lucerne areas were also sampled.

Articles on the soils of Nelson and Marlborough were published in the August and October, 1919, issues of the *Journal*. The results were most instructive, and indicated the need for further research on the soils of these districts. Mr. Rigg, the agricultural chemist to the Cawthron Institute (and late assistant in this laboratory), is now engaged in making a soil survey of Nelson.

An article embodying the first part of the Manawatu soils investigation, and dealing with the dune areas of the west coast of this Island, has been published in the *Journal*. The comparative richness of the dune lands in mineral plant-food is there made public. A report on the encroachment of sand-dunes at Kawhia was made to the Director-General in June, 1919. The importance of adopting a progressive policy in utilizing the dune areas of New Zealand has been pointed out not only in order to make waste lands productive, but also to fix sand-dune areas and prevent their destructive action on adjoining good land—an action which is taking place in many localities in the Dominion.

At the request of Mr. F. W. Ferkert, Assistant Engineer-in-Chief, Public Works Department, the composition of the Canterbury scrub lands has been again investigated. Some previous results of

analyses of lands at West Eyreton are given in the *Journal* for August, 1913. Mr. Furkert has had further samples taken, and these, after separation from the gravel, proved to be fine sandy silts deficient in available and total phosphoric acid, the amounts of nitrogen and other mineral plant-foods being high. The treatment indicated as most desirable would seem from analysis to be phosphatic and lime-carbonate manuring, and the stimulation of the growth of leguminosæ with a view to increasing the humus in these light lands.

The so-called "tarry" soils of Oamaru have been investigated, and found to have a lime-requirement of from $\frac{1}{2}$ to $\frac{3}{4}$ ton of carbonate of lime per acre. These soils rest on a limestone subsoil, and are another instance of the popular fallacy which assumes that because a soil is on limestone it contains sufficient lime.

Some kauri-peat soils collected by the Fields Instructor at Auckland proved to have a high lime-requirement and very low phosphoric-acid content. Further samples and field experiments are required, however, before generalizing as to the manurial requirement of this extraordinary type of soil.

The policy of examining the soils of the State farms in detail has been carried out at Weraroa, every paddock of which has now been sampled and analysed.

In connection with the lucerne experiments of Canterbury, samples of the land on which the lucerne has been sown have been taken for analysis.

Soil-investigations of the following districts have been suggested or applied for: North Auckland, Thames, Whakatane, and Westland. An understanding has been arrived at between this Department and the Lincoln College authorities that there will be no overlapping of work in connection with the soil-survey of some of the Canterbury counties, the work of which is being carried out at the Lincoln College Laboratory, and that the Department will confine its operations to counties other than those being investigated at Lincoln.

The following table shows the number of soil-investigation samples received during the year: From Whakatane County, 33; Ruakura Farm, 12; Mamaku Farm, 2; Rangitaiki district, 7; Thermal district, 11; Manawatu district, 49; Nelson District, 6; West Wanganui Inlet, 3; Westland District, 14; Canterbury District, 10; Otago Peninsula, 14: total, 161.

With regard to the testing of soils for lime-requirement, the following figures indicate, as an average, the net result of each instructor's work for the year. It must be borne in mind that reliable generalizations as to the average lime-requirement of any one province can be arrived at only after many more samples have been collected and tested.

Number of Samples collected.	District.	Average Tons of Lime-carbonate required per Acre.
70	Auckland	3·8
24	Wellington	1·8
6	Taranaki	2·3
8	Hawke's Bay	2·0
9	West Coast, South Island	4·9
14	Canterbury	1·3
16	Otago and Southland	2·3

LIME.

Limestone-supplies.

The testing of limestones and reputed limestones has been a prominent feature of the laboratory work; 161 samples were examined this year. Some of these samples were quite valueless for agricultural purposes; but the following summary of the more useful limestones tested during the year indicates many excellent sources of supply for both high-grade and low-grade limestone. The publication of Bulletin No. 22 (New Series) of the Geological Survey has brought up to date the available information of New Zealand lime-supplies.

Sample.	Particulars of Locality or Sender of Sample.	Carbonate of Lime (CaCO ₃).	Remarks.
		Per Cent.	
L/1	Kaipara Farmers' Lime Company	92·0	Calcareous sinter.
L/2	Kaipara Farmers' Lime Company	72·0	
L/11	Kaipara Farmers' Lime Company	79·0	
L/12	Kaipara Farmers' Lime Company	71·0	
L/21	T. Anderson, Carrington	85·0	
L/29	H. Jeffreys, Omahanui, Wairoa	96·0	
L/39	D. C. Smith, Whangarei	77·0	
L/40	D. C. Smith, Whangarei	74·0	
L/46	F. G. Worker, Wellsford	77·0	
L/47	F. G. Worker, Wellsford	83·0	
L/48	F. G. Worker, Wellsford	81·0	Soft stone.
L/55	E. Grigg, Eiffeleton	89·0	
L/103	C. W. Fairweather, Te Kaha	78·0	
L/104A	E. Broomfield, Whitford	87·0	
L/104B	E. Broomfield, Whitford	70·0	
L/135	W. G. Bambry, Marima, Pahiatua	53·0	
L/151	Milburn	88·0	
L/174	P. Evans, Te Akau	55·0	
L/182	Kaipara Farmers' Lime Company	68·5	
L/183	Kaipara Farmers' Lime Company	72·0	
L/214	R. P. Flood, Utakura, Hokianga	88·5	Soft stone.
L/224	H. J. Walton, Martinborough	90·0	
L/328	J. Fish, Aorere, Collingwood	69·0	
L/329	F. Hewitt, Waipukurau	65·0	
L/330	F. Hewitt, Waipukurau	75·0	
L/341	Farmers' Union, Mahoenui	94·0	

Sample.	Particulars of Locality or Sender of Samples.	Carbonate of Lime (CaCO ₃).	Remarks.
		Per Cent.	
L/362	K. S. McKenzie, Te Kuiti	81·0	
L/363	K. S. McKenzie, Te Kuiti	95·0	
L/367	J. W. Carter, Collingwood	72·0	
L/381	S. H. Green, Dairy Flat, Auckland	51·0	Soft stone.
L/382	H. Feary, Takaka, Nelson	95·5	
L/399	J. L. Shanks, Kaukapakapa	64·0	
L/401	Kaipara Farmers' Lime Company	73·0	
L/402	Kaipara Farmers' Lime Company	70·0	
L/403	Kaipara Farmers' Lime Company	76·0	
L/404	Kaipara Farmers' Lime Company	82·0	
L/482	Hokianga Chamber of Commerce	57·0	
L/522	W. J. Newport, Takaka	97·0	
L/523	W. J. Newport, Takaka	91·0	
L/524	W. J. Newport, Takaka	95·0	
L/527	A. Thomson, Chancet, Ward	73·0	
L/528	A. Thomson, Chancet, Ward	85·0	
L/538	J. P. Turnbull, Napier	92·0	Soft stone.
L/581	J. T. Boyde, Paparoa, Kaipara	92·5	
L/582	J. T. Boyde, Paparoa, Kaipara	86·5	
L/583	J. T. Boyde, Paparoa, Kaipara	87·5	
L/624	C. S. Dalglish, Matari Valley, Murchison	93·0	Soft stone.
L/631	T. Anderson, Carrington	86·5	
L/632	D. J. Macauley, Carrington	91·0	
L/676	Hokianga Chamber of Commerce	66·0	
L/683	Instructor Patterson, Warkworth	72·0	
L/684	Instructor Patterson, Purewa	84·0	
L/685	Instructor Patterson, Purewa	75·0	
L/686	Instructor Patterson, Purewa	71·0	
L/708	Hawkes and Robertson, Kaukapakapa	60·0	
L/738	J. E. Simes, Matakau	93·0	
L/761	D. McGregor, Gladstone	90·0	
L/765	Hokianga Dairy Company	62·0	
L/779	H. J. Walton, Martinborough	65·0	
L/793	A. Hobbs, Balfour	83·0	
L/837	Sir W. Buchanan, Gladstone	87·5	
L/838	Sir W. Buchanan, Gladstone	84·0	
L/839	Sir W. Buchanan, Gladstone	81·0	
L/840	Sir W. Buchanan, Gladstone	90·0	
L/841	Sir W. Buchanan, Gladstone	92·5	
L/842	Sir W. Buchanan, Gladstone	87·5	
L/877	S. B. Newcombe, Tauhoa	91·0	
L/878	G. Thompson, Port Albert	80·5	Soft stone.
L/879	G. Thompson, Port Albert	72·0	
L/927	H. F. Stewart, Kaukapakapa	80·0	
L/953	I. Patterson, Reefton	80·0	
L/963	C. R. D. Kemp, Gladstone	91·5	
L/964	C. R. D. Kemp, Gladstone	93·5	

Development of Limestone Resources.

Advice on the subject of grinding limestone and "burning" lime has been given in response to inquiries from time to time. In order to place this work on a more satisfactory footing it was decided to form a committee of Government experts to assist and advise those interested in working limestone deposits. The committee consists of Mr. F. W. Furkert, Assistant Chief Engineer, Public Works Department; Mr. P. G. Morgan, Director of the Geological Survey; and the Chemist to the Department of Agriculture.

The utilization of sea-shells is receiving attention in North Auckland, particularly in the Kataia district, where there is a proposal to form a co-operative company in this connection.

Some field experiments designed to test the calcareous mudstone termed "papa" have been published (see *Journal*, April, 1916, p. 303). It is difficult to see how it could prove remunerative to apply a substance like papa, which contains only a very small percentage of carbonate of lime, as the material which is effectively useful. Some varieties of papa may be baked in a wood-fire kiln to a consistency and hardness of the best drainpipes and have the following composition after calcining, the sample being from Tokimira: Silica (SiO₂), 64·30 per cent.; alumina (Al₂O₃), 17·70 per cent.; iron oxide (Fe₂O₃), 8 per cent.; calcium oxide (CaO), 2·70 per cent.; magnesium oxide (MgO), 2·28 per cent.; alkalis (soda and potash), 4·37 per cent.; loss on ignition, 0·65 per cent.: total, 100 per cent.

Lime Legislation.

Many farmers are under the impression that legislation regulating the composition of lime supplied would be an admirable thing in New Zealand. It is extremely doubtful if such legislation would improve matters, but there is little doubt that it would increase the cost of the lime to the consumer. The Department has taken some steps to obtain information regarding the practice of other countries, and it is significant to note that the great English-speaking agricultural countries have no legislation limiting the sale of lime to that of any particular quality or specifying standards of purity. It is not thought advisable at present to put any restrictions on the output of lime by laying down the standards, as the quality of the lime sold is likely to vary so much in every district with the quality of the stone and the facilities for reducing or calcining it. The most that can be recommended is that it may be permissible for vendors to sell lime under a guarantee of purity. The purchaser would then have civil right of recovery for any breach of warranty.

FERTILIZERS.

Fertilizers on the New Zealand Market.

An endeavour has been made during the year to put the work of the supervision of the fertilizer trade on a more satisfactory footing than has hitherto prevailed. The systematic collection of official samples for testing under the Act has been instituted. Some samples have proved to be of a quality inferior to the guaranteed analysis, and further investigations have been made. One prosecution is already arranged, and legal proceedings are likely to be instituted in at least two other instances. In order to secure publicity of the quality of the numerous brands of fertilizers on the market it was arranged to publish in the *Journal* all registrations of fertilizers. The registration of fertilizers has also been conducted by the Chemistry Section during the year. The investigation of several fertilizers of doubtful quality has been occupying a good deal of time.

Fertilizer Law.

It is essential that the fertilizer law of the Dominion should be brought into line with that of other countries, or even in advance of those countries. One has much sympathy with those farmers who would like to see the invoice certificate state exactly from what ingredients the fertilizer is made. Since mixtures containing coaldust, ground limestone, and aluminium phosphate are coming into use in New Zealand as fertilizers(?), it is highly desirable that farmers should know for what they are paying such huge prices.

In connection with the administration of the Fertilizers Act it is desirable that a stricter supervision should be exercised in future. If an officer could be detailed to devote his entire time to this work during the fertilizer season it would no doubt have the effect of correcting much looseness which exists even in some of the largest firms regarding their compliance with the provisions of the Act.

Phosphates.

The supply of phosphatic fertilizers has engaged the special attention of the Department for many years past, but during the year 1919-20 this subject has been particularly important by reason of the arrangement for supplies from Nauru Island. The Nauru Island phosphates were dealt with in a special report submitted by the Chemist for the information of the Board of Agriculture (see Parliamentary Paper H.—29B).

The prospect of increased imports of phosphate rock has made it necessary to arrange for additional supplies of sulphuric acid for treating the rock. Attention has been directed to the New Zealand supplies of sulphur, which it is hoped to utilize for the preparation of superphosphate within the Dominion.

Advice has been received that about 42,000 tons of rock phosphate will be delivered at New Zealand ports during the year 1920. Most of this rock will come from Makatea and Ocean Islands. The total amount is said to be about the maximum quantity that can be ground by the existing New Zealand works in their present state of efficiency. It is expected, however, that during the year 1921 new and improved mills for the grinding of phosphate rock will be in operation, and that the total grinding-capacity of New Zealand works will reach 80,000 tons.

It is of interest to note that the 42,000 tons of imported rock phosphate arranged for this year compares more than favourably with the quantities imported during recent years, for which the figures in tons for the years ended 31st March are as follows: 1914, 22,093; 1915, 23,983; 1916, 39,366; 1917, 24,993; 1918, 37,037; 1919, 31,351.

A number of samples of reputed phosphates have been received and tested.

Inquiry has been instituted with regard to a patent phosphate made by an electrolytic method, called Palmaer phosphate, which it is considered might be useful for New Zealand soils, and possibly might be manufactured in the Dominion.

A practice of adulterating in Australia bonedust intended for export to New Zealand with from 10 to 15 per cent. of superphosphate, which has sprung up during the last year, has been brought to light, and the importers in New Zealand have all been warned in order that they may protect themselves.

The supplies of basic slag have recently been scarce, and some of low grade contained only about 10 per cent. of insoluble phosphoric acid. The question of the supply of basic slag is deemed so important in Great Britain that a conference of scientific men of the highest standing was recently convened to consider the whole question of supply.

Early in the year the top-dressing experiments with New Zealand artificial slag (manufactured in Dunedin) at Wallaceville Laboratory Farm were reported upon. The results of hay from experiments with the artificial product made in the South Island, as compared with basic slag, were as follows, both being applied as a top-dressing on 14th April, 1918, at 4 cwt. per acre, and the hay being cut on 18th January, 1919: Artificial slag, 9½ cwt. of hay per acre; basic slag, 14½ cwt. of hay per acre.

Recently the quality of a new basic slag manufactured in Auckland was analysed, and it appeared that the phosphate (the valuable part of the slag) was not naturally present, but had been added for the purpose of making the slag useful as a fertilizer.

The supply of phosphates for departmental use has been attended to from time to time. A consignment of 50 tons of bone-char was procured from Australia. This fertilizer contained about 70 per cent. of tricalcic phosphate, and was finely ground—the residue on $\frac{1}{30}$ in. sieve being only 2 per cent., while 38 per cent. of the material passed through a $\frac{1}{20}$ in. sieve. This fertilizer was distributed to the various experimental farms. In addition, 50 tons of Ephos phosphate was purchased for the Department.

Nitrogenous Fertilizers.

There has been a movement afoot to establish the local manufacture of nitrogen compounds from the air. But it appears that, while the New Zealand demand for nitrates is limited, the supply available from Chile is enormously large, and the prospect of successfully competing against other countries in electrically manufactured nitrogen compounds is small. Moreover, it has been pointed

out that the application of nitrogenous fertilizers in New Zealand to lands deficient in phosphates tends to produce a rank growth of crop and increases susceptibility to plant-diseases. In view of these circumstances it was not considered advisable to give much encouragement to the proposal for the local manufacture of nitrogen fertilizer compounds. The Department has obtained a supply of Chilean nitrate of soda, and the Instructors in Agriculture for Canterbury, Otago, and Southland are arranging for experiments to be conducted with this fertilizer.

Potash.

A sample of wood-ashes from the Hamilton sawmills was analysed in June, 1919, and found to be of good quality, containing 5.37 per cent. of soluble potash and 9.96 per cent. of potash soluble in hydrochloric acid—total potash. There was practically no demand for these ashes. Another sample of wood-ashes sent in by a farmer in the Kawakawa district was analysed and found to contain 4.23 per cent. total potash, 3.14 per cent. soluble potash, 1.24 per cent. phosphoric acid, and 32.04 per cent. lime.

Inquiries regarding the production of potash from seaweed have been received. Owing to the prospect of the liberation of supplies from Alsace and other European sources, there seems to be less likelihood than ever of economically producing potash fertilizer from local sources.

With regard to the imports of potash, the Director-General has been in communication with the High Commissioner and also with the manufacturers of mixed fertilizers in New Zealand. Supplies of Alsatian potash salts and German potash salts are now available in New Zealand.

The utilization of wood-ashes from sawmills has not in practice proved a success, owing chiefly to the lack of interest displayed by the producers of the by-products. The amount available from this source is, moreover, very small.

"Radio Manure."

Early last year a fertilizer called "Radio Manure" was brought under the notice of the Department, and was duly registered under the Fertilizers Act. This manure is mixed at Hamilton, and has been offered for sale in various parts of the North Island. It has been freely advertised by pamphlets and in the newspapers, and many farmers have given testimonials that the compound is efficacious as a fertilizer. The mixture consists mainly of coaldust and limestone, with a small amount of phosphate. The Department made arrangements to have the "Radio Manure" tested by experiments under the supervision of the Instructor in Agriculture, Auckland, and the Fields Instructor, Wanganui. The Stratford trials were conducted on new land, free from the influence of previous manuring, and it was found that the yield of turnips from the plot treated with "Radio Manure" was practically the same as the yield from the control plot, which was unmanured. At the same time plots treated with ordinary commercial fertilizers gave a very much higher yield. Some of the vendors had suggested that the manure was exceptionally radio-active, and would consequently have a beneficial effect on plant-growth. A sample was therefore submitted to Professor Marsden, of Victoria College, and the result of his test showed that the radio-activity of "Radio Manure" was less than that of ordinary Wellington soil. Moreover, the experiments conducted in England so far indicate no hope of the successful employment of radium ores as an aid to either horticulture or agriculture. An official sample of "Radio Manure" was analysed in this laboratory and found to be below the guaranteed analysis as registered under the Fertilizers Act. As the deficiency was materially to the prejudice of the purchaser, a prosecution was instituted. The case against the vendors was heard in the Magistrate's Court, Marton. The evidence of the prosecution was not contested, but the case was dismissed on the technical point that the information had been laid against the manager of the company instead of against the company. Arrangements have been made to publish the details of the case, as well as the results of departmental trials, in the *Journal*, so that the farming community may be informed of the position in regard to this reputed fertilizer.

"Carbon, Iron, and Lime Mixture."

Another "fertilizer" which is much advertised and is being sold in the Auckland Province, is called the "Carbon, Iron, and Lime Mixture." This is not sold as a fertilizer, but only—it is presumed—as a substance to supplement or dilute fertilizers. It is manufactured by an Auckland firm (quite distinct from the mixers of "Radio Manure"), but it is also composed mainly of coaldust and limestone. The Department has analysed several samples, and field experiments are being conducted to ascertain the agricultural value of the mixture.

Fish Products.

Inquiry has been made as to whether a fish- and shark-products company could be started in the North. It would appear that far more definite data are required as to the constancy of the supplies before any definite advice could be given. It is known, of course, that immense quantities of fish and sharks visit certain parts of the coast at intervals, but definite information is wanting as to the daily catches of material which can be relied upon, even during a season of a few months. The products from such an industry would be chiefly insoluble nitrogenous fertilizers, fish-oil, and fish food.

DEFICIENCY DISEASES.

A report has been submitted to the Director-General, and to the Director of the Live-stock Division, who controls the bush-sickness experimental farm at Mamaku, suggesting new lines of experimental work, and steps have been taken to initiate several new experiments.

The experiments of Glenhope have been continued. The deficiency disease in that area is now considered to be very similar to bush-sickness. What is also a similar trouble has been reported from Tuatapere, Waiau Valley, Southland. The soil of the Tuatapere locality was analysed. The lime-magnesia ratio was unbalanced, and the lime-requirement test showed that $2\frac{1}{2}$ tons of carbonate of lime per acre were required.

WORK FOR THE DIVISIONS.

Live-stock Division.

A good deal of work has been done in co-operation with the Live-stock Division, and the following are the more important subjects:—

Stock diseases: The investigation of soils and general assistance with the experiments at Mamaku Farm and at Glenhope (Nelson) has necessitated periodic visits to these places. The preparation of stock-licks has been carried out at the Wallaceville Laboratory, and new stock-medicines have been made up for the Pathologist there. The Chemist has arranged for the supplies of chemicals, and has supervised the making of the licks.

Sheep-dips: A few samples of sheep-dip have been analysed during the year. Advice has also been given on the question of the registration of sheep-dips, it being suggested by the Chemist that this matter should be dealt with by means of introducing a comprehensive Insecticide Act on the lines of the statutory provision in the United States. The necessity for such a law in New Zealand as will regularize the sale of sheep and cattle dips, and plant sprays and disinfectants, is continually being felt, and it would be the means of protecting the honest proprietor against fraudulent competition, as well as safeguarding the producer.

Cattle-dipping solution: In connection with the Department's efforts to control the cattle-tick in the Auckland Province, arrangements have been made with the Live-stock Division for the testing of samples, in order that the dip may be kept uniform in strength. The first sample was received on 24th January, 1920, from the Oakleigh dip. In order to make comparisons from time to time, a request has been made for a sample of the original fluid to be sent for analysis.

Stock foods and waters: Two samples of calf-foods were analysed. The first compared favourably with stock-foods previously analysed by the Department, but a second was not up to the standard of the other samples, being low in protein and containing a large amount of undigestible carbohydrate matter due to the shucks of the grain being used. Waters for stock have been analysed.

Rabbit-poisoning: Information has been collected regarding supplies of carbon bisulphide, which has been found very effective as a rabbit-poison, and an article on this subject was published in the *Journal*. The local manufacture of carbon bisulphide has been suggested, and this phase has been the subject of a report by the Chief Electrical Engineer (Mr. Birks). It is doubtful if it would pay to install a plant for making rabbit-poison alone, but if the demand could be increased for other industries the project might be feasible. One settler desired authority to experiment with poison gases to cope with the rabbit pest, but owing to the danger to human life the Department did not entertain the proposal. Inquiries are being made with a view to securing a source of cheap strychnine-supplies.

Dairy Division.

At the request of the Dairy Division arrangements have been made for the analysis of condensed milk for export, and any consignment will be analysed, thereby providing the exporter with the same quality-guarantee as is in use in the Australian States.

The testing of export butter for moisture-content has been continued during the year, thirty-seven samples having been dealt with.

The analysis of potable waters for dairy purposes has been carried out as hitherto.

Horticulture Division.

Some samples of spraying-materials, a sample of fruit-juice, and a sample of fertilizer were analysed. In addition, several samples of poisonous honey have been received for examination, but owing to the difficulty of securing sufficiently large samples little could be done in the matter. General advice as to spraying-compounds has been given from time to time as required.

TOXICOLOGICAL.

The usual lead-poisoning cases have occurred, and have been detected in specimens sent in to the Laboratory. In one cow's stomach about 3 ozs. of lead-paint was found.

Periwinkle (*Vinca major*) has been suspected of poisoning a cow driven, it is supposed, by hunger to partake of it. Periwinkle is a naturalized plant which is spreading in some parts of the country.

Another plant suspected of poisoning stock was *Ranunculus sceleratus*, the "cursed crowfoot," a well-known poisonous introduced plant common on the margins of ponds and other wet places. Buttercup-poisoning has been mentioned in the *Journal* (June, 1918, p. 325). Poisoning of stock by any of the species of *Ranunculus* is extremely difficult to establish definitely.

The medicinal value of tutin, the active principle of the tutu-plant (first isolated in this Laboratory) is being investigated by two well-known New Zealand medical men. Dr. James Macpherson has already published a paper in the *New Zealand Medical Journal*, Vol. XIX, No. 89, in which he states (p. 13), "Much fuller investigation and observations of the action of the drug are necessary, but I feel that I am warranted at this stage in recording its manifest and striking physiological actions. Based on these, I believe the drug might prove useful (1) as a heart-tonic in cases of broken compensation with œdema, (2) as a diuretic, (3) as a purgative or adjuvant to purgatives, and (4) as a general tonic."

BEET-SUGAR.

When in Christchurch in February, the Chemist was interviewed by the gentlemen who are floating a company or syndicate to establish a beet-sugar factory in Canterbury—Mr. Tulloch and Mr. Taigel (expert in beet-sugar manufacture). They were supplied with all the information published in the 1907 8-9 reports of the Chemistry Division, and the matter was discussed at length. It appears that one of the conditions insisted upon by their supporters is that the factory should be established in Canterbury. This seems to be rather unfortunate, as it may afterwards be found that Canterbury with its abnormal climate and soil is not so well adapted as some other provincial districts, notably those of Otago and Southland, where the greater rainfall, longer growing-day, deeper soil, colder

harvesting period, better limestone and fuel facilities, and more intensive agriculture generally practised would augur a better chance of succeeding with this entirely new industry.

Some sugar-beet is now being grown at Ashburton, and arrangements have been made with Mr. A. Macpherson, Fields Instructor, to assay some of the roots for their percentage of sugar. It is rather curious that Canterbury is a district from which no beets have ever been tested in this Laboratory for sugar-percentage, although much work has been done on samples from Ruakura, Waikato, Auckland, Moumahaki, and Otago. A leading article in the *Christchurch Press*, of 18/2/20, summarized the work of this Department in the matter.

DIATOMACEOUS AND SILICEOUS EARTHS.

Excellent samples of these earths continue to be received from widely spread localities, showing that there is no necessity to import this material for manufacturing purposes. A note on the subject, was published in the *Journal* for March, 1920.

INDUSTRIAL AND MISCELLANEOUS.

Wool-greases.—Machinery for separating wool-fat in a wool-washing plant has been installed at Oamaru, and is reported to be working satisfactorily.

Wool-refuse.—A sample of wool-refuse, the cleanings from wool badly contaminated with the common New Zealand burr, utuwai, piripiri, or bid-a-bid (*Acaena sanguisorbae*), was found on analysis to contain 6.8 per cent. of fat. Wool-fat is evidently absorbed to a great extent by the utuwai. This was interesting enough; but when the sender explained that such utuwai when left in a heap spontaneously took fire and burned to an ash, the subject became more important. Fires in wool-ships, which were so disastrously common some ten or twelve years ago, may have been caused by the practice of shipping bales of very "seedy" wool. The idea seems to merit further inquiry, bearing in mind the extremely hygroscopic nature of wool-grease, and the ease with which vegetable fibres will spontaneously take fire, provided suitable amounts of moisture and conditions for retaining the heat generated are present. A note was inserted in the *Journal* for November, 1919, calling attention to the matter.

Arsenic-supplies.—Assistance has been given—in conjunction with the Customs Department—to manufacturers of sheep-dips to enable them to import arsenic from Japan in tins instead of iron drums, as provided by the regulations.

Red-clover Seed.—An interesting specimen of red-clover seed, in which masses of the seed were balled together with some syrupy matter, was submitted by the Biologist. The substance dissolved in water, and reduced Fehling's solution without previous inversion. It now appears that the phenomenon is well known in America, and is caused by an aphid.

Quality of New Zealand Leather.—The quality of the leather produced in New Zealand has been under review, and a preliminary report has been furnished to the Director-General as to certain objectionable practices adopted by some tanners.

Paint Materials.—Several samples of soft carbonate of lime have been submitted to a firm of paint-manufacturers with a view to the discovery of a source of putty-powder which all has to be imported at present. No sample was found to be suitable for the purpose.

Sulphur-supplies.—The importance of ensuring a continuance of supplies of sulphur has claimed a share of attention. At present the bulk of our supplies comes from Japan. There are, however, large quantities of sulphur in the thermal district of the North Island, and these, if more accessible, would undoubtedly be worked. Reports on the subject have been submitted to the Director-General.

Fencing-wire.—Information regarding means of testing fencing-wire has been collected with a view to instituting some protection against inferior qualities.

SAMPLES RECEIVED.

The following is a list of samples received during the twelve months under review: Soils collected by Chemist, 156; soils collected by field officers, 214; miscellaneous soils, 98; limestones, 161; barks for tanning and dyes, 12; reputed phosphates, 51; fertilizer and reputed fertilizers, 104; fertilizers sampled under the Act, 35; butter, 37; milk, 15; toxicological specimens, 13; stock-foods, 6; waters, 13; spraying-materials, 8; grass-seeds, 8; oils, 7; sheep and cattle dips, 4; sheep-drenches, 2; honey, 4; cheese, 3; miscellaneous minerals, 19; other miscellaneous samples, 16: total, 986.

BIOLOGY SECTION.

REPORT OF THE BIOLOGIST.

The Director-General.

Wellington, 1st June, 1920.

I HEREWITH submit my annual report on the main lines of work carried out by this Section during the year ended 31st March last.

A. H. COCKAYNE, Biologist.

VISIT TO THE UNITED STATES.

I left New Zealand on 11th August, 1919, and visited the United States, returning on 14th February, 1920. During this period Mr. R. Waters carried out the duties of officer in charge of this Section with every satisfaction. To him and to all the other members of my staff I give my sincere thanks for the very capable way in which they carried out their various duties during my absence.

In the four and a half months spent in the United States I was enabled to visit many of the agricultural institutions in the west, middle west, and eastern States, devoting myself mainly to a study of agronomical conditions from the standpoints of education, research, and extension.

SEEDS AND SEED-TESTING.

The seed-testing branch of my Section continues to grow steadily, and during the year over eight thousand samples were analysed for germination and purity. While in the United States I paid considerable attention to seed-testing methods in vogue there, and also studied the effect of many of the seed laws that are in operation. With regard to seed-testing great care is taken that lines reported on are extremely carefully sampled. This is a matter requiring considerable attention on the part of merchants here. Many if not all the discrepancies arising in the germination of such seeds as cocksfoot, Chewings fescue, and the like are due to the sending into the laboratory of samples carelessly sampled and not truly representative of the line in question. I found this same defect had been quite common in the seed-testing work of many of the States, but seed-merchants there now recognize that the laboratory test is true only of the sample submitted, and if not sampled properly may give quite an erroneous result so far as the whole line is concerned.

Very special emphasis is given in the United States on the control of imported seed, and unless lines come within the standards of real value—i.e., certain definite percentages of purity and germination—such seed is not allowed to be sold. Some similar method of control of imported seed should operate in New Zealand, and this phase of the question has been embodied in a Pure Seeds Bill which has now been prepared.

During the year very considerable losses have been suffered by merchants in the export from New Zealand of Chewings fescue, owing to its great loss in vitality during transit overseas. The causes of this deterioration are now being made the subject of special investigation in co-operation with the Bureau of Plant Industry, at Washington. The overseas demand for Chewings fescue is rapidly diminishing owing to the unsatisfactory germination on arrival in Europe and America. It is hoped that the studies on the loss of vitality in Chewings fescue will have a wide significance, and will be valuable in putting the storage and shipment of many agricultural seeds on a better footing.

The prices for agricultural seeds have been maintained at an extremely high level during the year. This is especially true of grass and clover seeds, such as danthonia, brown-top, lotus, and others that are particularly necessary for the grassing of our poorer lands. In fact, so high has the price of danthonia become that it should be the policy of all large users of the seed of this grass to lay down paddocks specifically for seed-production.

PLANT-PATHOLOGY.

The two main lines of work in plant-pathology have been a study of the dry-rot fungus of swedes (*Phoma napo-brassicae* Rost.) and fire-blight (*Bacillus amylovorus* Burr.). Much valuable information on the control of cabbage *Phoma* was secured in Wisconsin, where infected seed has been shown to be the main method of spread. From experiments conducted here, however, it appears conclusive that the swede dry-rot fungus is a soil saprophyte capable of living in the ground for several years. Nevertheless its appearance from time to time in crops grown on virgin land indicates that the sowing of infected seed is a factor in its dissemination. From the preliminary experimental work carried out it has been shown that the application of large quantities of water-soluble phosphates increases the disease considerably, and that potash manures have a depressing effect on the development of the fungus. Much work of a fundamental nature still remains to be done before practical methods of control can be laid down.

Fire-blight, which is justly considered one of the most dangerous diseases of pip-fruits, made its appearance for the first time in New Zealand during the summer in the Auckland District. Conditions being favourable for flower-infection, the disease spread rapidly, and considerable areas of the Auckland Province have become infected. It is especially bad in the Waikato. Apart from apples and pears, hawthorn has been found to be seriously affected, and much work has been done to determine whether hold-over cankers are developed on this plant. Present indications are that such is the case, and if this proves correct it will make the control of fire-blight extremely difficult in districts where hawthorn hedges are largely grown. Just how and when this bacterial disease was imported has not yet been ascertained, but from investigations conducted it appears that the disease is of extremely recent origin here, and the reports that it has been in the Dominion for many years have no foundation.

Considerable attention has been given to wheat-diseases, especially with regard to take-all (*Ophiobolus graminis* Sacc.). The control of wheat-diseases, owing to the altered economic and national position of this crop due to the lessened production of the world's breadstuffs, has become of considerable moment in New Zealand, and warrants special study being given to the subject.

Yellow-leaf of phormium has been the subject of considerable study, and a new species of *Ramularia* very similar to the one causing a root-disease in ginseng has been isolated. So far, inoculation experiments have been of a negative character, but it is more than probable that this *Ramularia* is a weak pathogene only capable of infection when the phormium-plants have been weakened by adverse soil-conditions. As has been pointed out by Dr. L. Cockayne, at the present time there is a very general improvement in the vigour of flax swamps, and in consequence yellow-leaf is far less pronounced than last year.

During the year very considerable amounts of mycological material have been collected, and the cryptogamic herbarium has been largely increased. This work is of fundamental importance in the work of the plant pathological laboratory, and it is hoped shortly to establish a series of exchanges with foreign institutions in order to strengthen the collections. As was usual in past years, a large number of mycological specimens have been examined and reported upon. This portion of the work of the Section continues to grow, and takes up much time and patient study.

ENTOMOLOGY.

Apart from the routine work on the identification of insects and supplying information on control, a considerable amount of original investigation has been carried out. The insect pests of the eucalyptus plantations of the South Island have been given some study, and a publication on the subject is being prepared. Work also on the life-history of the meadow-foxtail midges, the grass-grub, and the pear-bud midge has been undertaken. There has, however, been much call on Mr. D. Miller's services for field-work, and this renders difficult the carrying-out of any sustained laboratory investigations.

AGRONOMY AND AGROSTOLOGICAL INVESTIGATIONS.

Work on the ecology of New Zealand grasslands has been continued, and to this work Mr. E. B. Levy has devoted a large amount of time. Many photographs of numerous ecological phases of grassland production and management have been secured, and these have been found to be of the greatest value in extension work along the line of farmers' lectures. Advice on grassland work in general has steadily increased, and the work of this Section along these lines has done much towards an improvement in our grasslands.

FIELD EXPERIMENTS AND AGRICULTURAL EXTENSION.

Much of my time has been occupied in the planning of experimental work on the experimental and demonstration areas, notably at Winton, Gore, Ashburton, and Marton. Advice and field work in connection with the agricultural extension work carried out by the Fields Instructors has also had to be undertaken from time to time.

LECTURES AND EDUCATIONAL WORK.

During the year many lectures to farmers have been given, both in the North and South Islands, and a series of lectures have been given to the returned soldiers undergoing training at the Central Development Farm, Weraoa.

HEMP-GRADING SERVICE.

REPORT OF THE CHIEF HEMP-GRADER.

The Director-General.

Wellington, 15th May, 1920.

HEREWITH please find my annual report for the year ended 31st March, 1920.

W. H. FERRIS, Chief Hemp-grader.

VOLUME OF PRODUCTION.

The quantities of hemp and tow received at the grading-stores for the year ended 31st March, 1920, again show a very marked decrease compared with the previous corresponding period. The large reduction is accounted for by the low prices ruling during a great part of the season and by the high cost of production. Only those millers who were favourably situated could produce hemp at the prices offering. Also, during the three months when the shortage of coal caused a curtailment of the railway service, very few mills were able to carry on, and the industry was practically at a standstill. The grading-port most affected by these causes was Bluff, the total number of bales of hemp graded being only 7,612, as compared with 20,053 for the previous year, a decrease of 12,441 bales. Wellington and by-ports show a decrease of 13,818 bales, Auckland 10,012 bales, and Foxton 9,634 bales.

Drought in the Bay of Plenty and Waikato districts was responsible for the destruction of large areas of green flax by fire, while blight and disease in the Manawatu district was the cause of a decrease of at least 8 to 10 tons of fibre per day.

PRICES.

The average f.o.b. prices per ton obtained for phormium fibre for the past year are as follows: Hemp—Good-fair £33 10s., high-fair £31 10s., low-fair £28, common £23. Tow—First grade £8 10s., second grade £7 10s., third grade £6. Compared with the previous year these prices show a decrease of £8 10s. for good-fair and high-fair, £10 for low-fair, and £7 for common, whilst the price of tow has increased by £1 per ton in all grades.

QUALITY OF FIBRE.

The quality of the hemp during the past year, as can be seen from the attached tables, shows an all-round improvement at all the grading-ports as compared with the previous year. The percentage of good-fair is increased by 9 per cent., and low-fair and common also show a moderate improvement. This without doubt is due principally to a difference of £3 to £5 per ton ruling during a great part of the year between the different grades, and it is to be hoped that this difference will continue, as the majority of millers will do their utmost to mill for the higher grades.

Most of the low-fair and common hemp graded at the ports of Foxton and Wellington was due solely to the very inferior (diseased) leaf several millers had to contend with, and very short leaf in the Southland District was responsible for the high percentage of low-fair graded at the Bluff. In many cases, however, the hemp graded during the year would have pointed much higher but for the unsatisfactory work in scutching. This branch of milling is invariably done under the contract system, and the tendency is to aim at quantity and not quality. One result of poor scutching (with the resultant bad tail on the hanks), is that cordage-manufacturers experience great trouble in spinning, and oversea buyers often complain strongly of this weakness in our fibre, which must have a detrimental effect on its sale. This fault has to be recognized in grading, and many large parcels dealt with during the year had in consequence to be put into a lower grade than that which the quality of the body of the fibre merited.

I would especially impress upon millers that something must be done to uplift the industry by improving the methods followed in the production of phormium-fibre, more especially in the scutching process. In so doing a regular quality of fibre would be produced, which would be appreciated by users and lead to an expansion of the demand. There is not the slightest doubt that in consequence of the large quantities of sisal now produced, and the improved methods of producing this fibre, phormium-fibre is likely to suffer in the world's markets unless something is done to materially improve on its present average quality. The loss to the Dominion on the past year's output caused by the production of low-grade fibre which would have easily secured a higher grade by extra scutching is estimated at between £10,000 and £12,000, this calculation being based on the difference of prices between the various grades. Not only is there a direct loss in the output of a low-grade article, but an indirect one caused by the prejudice created in the minds of manufacturers, who, perhaps being unaware of our better quality, discard phormium under the impression that they have seen our best.

The quality of the tow produced in the past season must be regarded as very satisfactory, the percentage of third grade for the Dominion being only 7.5 per cent., compared with 18 per cent. in the previous year. First grade has also gone up from 30 to 35 per cent.

The low prices offering and very small demand for stripper-slips were responsible for the large decrease in this by-product.

The Marlborough, West Coast (South Island), and Wairoa districts still uphold their reputation for turning out a first-class quality of fibre, and millers in these districts have no trouble in disposing of most of their output to local manufacturers. There are also several millers in the Wairarapa and Manawatu districts who deserve special mention.

MANUFACTURING PROCESSES.

A sulphur-bleaching process has been carried out by a few millers, but so far has not been as successful as was anticipated.

GRADING STATISTICS.

The following tables give particulars of the grading during the year ended 31st March, 1920, the Dominion totals and percentages for the previous year being also shown for comparison in the first three tables:—

Hemp (Bales).

Grading-ports.			Superfine.	Fine.	Good-fair.	High-fair.	Low-Fair.	Common.	Rejected	Con-demned.	Total.
Auckland	..	..	..	46	3,488	10,493	4,991	551	14	..	19,383
Foxton	..	..	..	14	2,250	14,964	5,480	491	212	..	23,411
Wellington	..	..	..	92	6,184	19,352	9,658	579	94	..	35,959
Bluff	..	..	..	..	305	2,650	2,625	301	13	..	5,894
Dunedin	..	..	..	..	315	752	535	116	..	..	1,718
Blenheim	..	..	..	4	1,136	40	13	19	3	..	1,215
Picton	..	..	..	394	264	14	..	..	..	..	872
Napier	..	..	..	..	2,108	..	..	..	..	..	2,108
Lyttelton	..	..	..	50	178	80	..	..	..	..	308
Totals, 1919-20	..	..	..	800	16,228	48,345	23,102	2,057	336	..	99,868
Percentage	..	..	..	0.88	17.82	53.23	25.43	2.26	0.37	..	..
Totals, 1918-19	..	..	..	571	12,150	72,970	44,105	6,276	596	105	136,773
Percentage	..	..	..	0.41	8.92	53.32	32.23	4.61	0.43	0.08	..

Total decrease in 1919-20, 45,905 bales.

Tow (Bales).

Grading-ports.				First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
Auckland	..	..	..	73	2,124	872	61	3,130
Foxton	..	..	..	890	4,305	353	1	5,549
Wellington	..	..	..	4,702	3,435	209	9	8,355
Bluff	..	..	..	..	662	89	..	751
Dunedin	..	..	..	..	121	..	..	121
Lyttelton	..	..	..	185	314	6	..	505
Blenheim	..	..	..	375	148	4	..	527
Picton	..	..	..	280	85	..	..	365
Napier	..	..	..	455	..	..	..	455
Totals, 1919-20	..	..	..	6,960	11,194	1,533	71	19,758
Percentage	..	..	..	35.5	57.5	7.5	0.35	..
Totals, 1918-19	..	..	..	6,669	10,869	3,930	485	21,553
Percentage	..	..	..	30	50	18	2	..

Total decrease in 1919-20, 1,795 bales.

Stripper-slips (Bales).

Grading-ports.				First Grade.	Second Grade.	Condemned.	Total.
Wellington	..	..	..	..	75	..	75
Foxton	..	..	..	..	57	..	57
Total	..	..	..	..	132	..	132
1919	..	..	..	..	599	..	599

Decrease in 1919-20, 467 bales.

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

Grading-ports.				Superfine.	Fine.	Good-fair.	High-fair.	Low-fair.	Common.	Rejected.	Condemned.
Auckland	..	..	..	..	0.23	18.00	54.20	24.70	2.80	0.07	..
Foxton	..	..	..	..	0.06	9.60	64.20	23.40	2.09	0.90	..
Wellington	..	..	..	..	0.25	17.00	53.50	27.00	1.60	0.26	..
Bluff	..	..	..	..	..	5.18	45.00	44.55	5.10	0.20	..
Dunedin	..	..	..	..	..	18.50	43.50	31.50	6.50	..	..
Blenheim	..	..	..	..	0.32	93.50	3.29	1.07	1.56	0.24	..
Picton	..	..	..	..	68.20	30.30	1.40	..	..	..	..
Napier	..	..	..	..	..	100.00	..	..	..	..	..
Lyttelton	..	..	..	..	16.00	58.00	26.00	..	..	..	..

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

Grading-ports.				First Grade.	Second Grade.	Third Grade.	Condemned.
Auckland	..	..	..	2.3	67.8	27.5	1.5
Foxton	..	..	..	16.0	77.7	6.3	..
Wellington	..	..	..	56.3	41.1	2.3	0.1
Bluff	..	..	..	..	88.3	11.7	..
Dunedin	..	..	..	..	100.0	..	..
Blenheim	..	..	..	71.1	28.1	0.8	..
Picton	..	..	..	76.7	23.3	..	..
Lyttelton	..	..	..	36.6	62.3	1.1	..
Napier	..	..	..	100.0	..	..	..

GRAIN-GRADING SERVICE.

REPORT OF THE CHIEF GRAIN-GRADER.

The Director-General.

Christchurch, 18th May, 1920.

HEREWITH please find my annual report for the year ended 31st March, 1920.

A. W. SMITH, Grain-grader

I have to report that grain-grading as carried out by the licensed Graders during the past year has given satisfaction, and has proved of great benefit to those engaged in the trade. I am sure that the confidence placed in those carrying out the grading duties will be maintained so long as the same unbiased and expert attention is given to sampling as is done at present. Periodical visits of inspection have been paid during the year to those ports where Graders are stationed, and I think that as the result of my visits there is now a more uniform interpretation of the standards on which the grading is being done.

During the year arrangements were made as regards placing the grading facilities at Dunedin on a much better footing. By payment of a retaining fee to Mr. J. Tipping by the Department, merchants in that town are assured that a Grader will always be available when required.

A request was received from the Gore merchants that a resident Grader be appointed there. In the past Gore merchants have at times sent down to Bluff in good faith certain lines of oats which, when the Bluff Grader sampled the line, he found were not up to the standard. As a result the trucks containing the oats were ordered back to store, which step incurred a great deal of expense. Consequently the Gore Grain-brokers' Association thought that if a Grader was appointed at Gore he could sample the oats on the truck and reject any not up to grade before the line was loaded. Although not altogether in favour of having Graders away from the shipping-ports, I visited Gore, and after an interview with the president and secretary of the local association I approved, as a trial, of the Gore nominee entering into a working arrangement with Mr. McQuarrie, Grader at the Bluff, whereby the former will be directly employed for this purpose by Mr. McQuarrie, the latter taking full responsibility for the certificates issued. When the present season is finished I will be able to state if this step has been a success.

During the year the New Zealand Government's purchase of wheat in Australia has continued to arrive in the Dominion, and a large portion of my time has been taken up in sampling and distributing the various cargoes. For the period covered by this report there arrived 1,255,362 bushels, and the quality taken over all shipments was superior to the sample on which the contract was made. The sampling as carried out by Messrs. Davidson Bros. on the Australian side has been conscientiously done, and I have had practically no complaints to make on this score during the year. My comments on those cargoes arriving previous to March, 1919, evidently had the effect of tightening up the sampling, as millers are very well satisfied with the quality of the wheat that has arrived since. The balance of the purchase of 4,000,000 bushels should all be landed in the Dominion by June. The arrangements whereby the licensed Graders act as arbitrators for the Wheat Controller are still in existence, and during the past year their services were availed of in the case of disputes.

At the request of the Wheat Controller I was transferred in October to the Wheat Control Office to understudy the duties of Assistant Wheat Controller, and in January, on the resignation of the then Assistant Wheat Controller, Mr. W. S. Pratt, I was appointed to the position, such appointment being contingent on my still supervising the carrying-out of the grading by licensed Graders. While in this position I will still be able to keep in close touch with the Graders.

The grain trade is still working on the descriptions of the grades submitted to their association by me in October, 1918, but up to the present has not availed itself of the offer made by me on behalf of the Department to set up permanent standard samples. I still have hopes, however, that the request will sooner or later be made, and if it does eventuate I shall bring my best efforts to bear on the question, and am confident that a set of standards acceptable to all parties will be established.

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