1928.

NEW ZEALAND.

DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT FOR 1927–28.

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

SIR,— Department of Agriculture, Wellington, 15th July, 1928.

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 31st March last.

The New Zealand agricultural year of 1927–28 may be fairly described as outstanding, the period having been marked both by increased production of our primary staples and enhanced market values for the produce. This dual movement was reflected in the Dominion's exports, which increased substantially in volume and value, the latter increment approaching nine millions sterling. The season's results are all the more remarkable in that they were achieved despite the handicap of abnormally droughty weather conditions experienced for a more or less lengthy period during the main season in several of the principal dairying and fattening districts. The producing situation was restored by a very favourable autumn, to which the affected farming industries responded in a manner characteristic of this country with its great natural advantages.

A very satisfactory account can be given of almost every branch of farming. On the pastoral side our sheep stocks increased by over one and a third million head during the year, and now stand at the highest numerical level in the Dominion's history. Wool-production naturally followed this upward movement, and growers were further favoured by a market of surprising strength, which increased their returns by several millions. With a record lamb crop to work on the frozen-meat trade established a new peak in this section. Here again good and advancing prices for fat stock ruled during the season. With the help of pasture top-dressing and other favourable influences, there seems no reason why our flocks should not reach the thirty-million mark in the near future.

Cattle, apart from dairy cows, registered a slight decline in the last enumeration, but the output of beef for export showed remarkable recovery from the drastic shrinkage of the preceding season. With the better prices ruling for beef, prospects are more encouraging, and it is hoped that cattle-raising will regain its former stability, even if only to fill the requirements of pasture-management on the rougher grasslands.

The dairy industry embodies the most intensive and specialized unit of the larger farming groups in New Zealand, and stands pre-eminently for close settlement of the land; its fortunes are therefore of special interest and import to the whole community. The past year registered a further advance in the industry's

main lines of production, an appreciable increase in butter more than counterbalancing a slight decrease in cheese. Our exportable surplus of butter and cheese has now reached the impressive quantity of 75,000 tons for each of these products. Dried milk and casein also showed increased production during the year. It is satisfactory to record that, following the preceding lean year, the financial returns to the industry were on a considerably higher level, and final payments to suppliers of consigning factories are likely to be still better in proportion, owing to the steady rising of market prices in the latter part of the season. The country's stock of dairy cows is again on the up grade in point of numbers, while herd-improvement activities are steadily gaining in volume and practical results.

The veal-export trade—in effect a subsidiary of the dairy industry—is now stabilizing on a good footing, and promises to become quite a large business, especially when combined with the value of the calf-skins. The manufacture of gelatine as a related industry is an important potential development which is now being investigated.

Pig-raising and pork-production are showing all-round expansion. The last statistical returns recorded a further large increase of pigs in the Dominion, and the season's exportation of pork, promoted by co-operative enterprise and assisted by a Government subsidy on the shipping freight, increased by nearly 70 per cent. Problems connected with the industry are now being attacked by trained investigators, and various practical measures for improvement in breeding, &c., are under way. This country, in short, has set out to win, on merit, a much larger share of the market for pig-products provided by the Motherland.

The chief feature of the arable cropping section was a substantial increase in the area under wheat, combined with a very high average yield. At over 38 bushels per acre, a total yield of some ten million bushels seems assured when threshings are completed, which would render the Dominion more than independent of wheat importations for some time to come. Among other cereals somewhat heavy shrinkages were recorded in the area of oats and barley, though satisfactory per-acre yields were secured. Maize remained practically stationary.

The fruitgrowing industry excelled itself during the year by exporting for the first time in its history over a million packages of apples and pears, besides making due provision for domestic consumption. The British market, however, has not given such good returns as in the preceding season, when a smaller yield was compensated by exceptionally favourable prices. Under good organization, however, the industry is facing the future confidently.

As regards the poultry industry, the export of eggs is being resumed this year with financial support from the Government, taking the form of a guaranteed return to produce-shippers. Poultry-keeping as a side-line for our small farmers and farm workers has great possibilities, and the industry is worthy of every attention.

A good honey crop was secured by beekeepers in general, and the exportable surplus of this product seems likely to increase. In line with the Government's policy of promoting the smaller rural industries, it has been decided to also extend financial support to the beekeeping industry in connection with the export trade, and arrangements are now in hand. Special encouragement is being given to small culture in various other directions—for example, by the introduction of better species of mulberry-trees for sericultural purposes. With the steady growth of our population these minor rural activities are every year gaining in extent and scope. The development of a strong force of small-holders in this country—complementary to the larger-scale rural industries—is eminently desirable.

The hemp (phormium fibre) industry of late has had to meet much less favourable market conditions than have prevailed for a considerable time, and production has also shown some shrinkage. However, with the help of certain economic adjustments, scientific research, and more general improvement in milling practice —all of which factors are receiving attention—a return to prosperity may be confidently anticipated.

Matters connected with artificial fertilizers were again to the fore. The price-cutting war between rival manufacturers, referred to in the last annual report, came to an end during the year. Under the agreement between the parties the price of superphosphate was raised to a point about midway between the old and

the lowest cut rates, and arrangements were made in connection with co-operative dairy companies which should react very favourably on the farming community. Farmers again purchased very heavily for pasture top-dressing purposes, and this practice has been introduced into the management of many farms—on hilly country in particular—which but for the trade war might not have adopted it for many years. As a matter of policy, the Government has made substantial concessions in railway-freight rates on fertilizers, the greater part of this subsidy being paid through the Agriculture Department's vote. There is no doubt that the increased volume of production of our farm-products during the last year or two can be traced largely to the increased use of fertilizers. In order to assure an ample future supply of phosphates, supplementary to the Nauru and Ocean Islands source, the New Zealand Government, in conjunction with the British and Australian Administrations, is conducting certain negotiations which it is hoped will end successfully.

A very marked advance on the scientific side of agriculture has taken place during the year, mainly as the result of organized and co-ordinated action on the part of all the bodies concerned—the Department of Agriculture, the Research Council and Department, the Cawthron Institute, the agricultural colleges, and certain University workers. Moreover, most valuable contacts have been made with various scientific institutions in Britain. Appreciative mention must also be made of various grants in aid of these activities by the Empire Marketing Board. An event of interest which took place during the year was the opening of the Massey Agricultural College at Palmerston North. This institution will have a strong research side in addition to its educational functions. The Canterbury Agricultural College is also receiving a substantial Government grant for research work. This joint effort cannot fail to exert a profound and beneficial influence on New Zealand agriculture.

During the parliamentary session of 1927 an exceptionally large and varied volume of agricultural legislation was enacted, affecting the interests of the farming community at many points. The preparation of Bills of this class is often a task of considerable magnitude, and all credit is due to the departmental officers chiefly concerned.

The reports of the Director-General of the Department and the divisional heads reveal an immense amount of useful service to the farming community. They also clearly demonstrate that the Department is maintaining its leading place in scientific investigation pertaining to New Zealand agriculture. The officers of the various branches are deserving of every credit for good work well done.

I have, &c.,
O. J. Hawken,
Minister of Agriculture.

His Excellency the Governor-General.

REPORT OF THE DIRECTOR-GENERAL.

THE HON. THE MINISTER OF AGRICULTURE. Wellington, 30th June, 1928.

I beg to submit the following report on the work of the Department during the past year:—

As will be gathered from the accompanying reports of the Divisional Directors and other responsible officers, a great volume of work has been done and the instructional activities have been further extended. In these divisional reports will be found information covering the whole of the activities of the Department.

The legislation relating to agricultural colleges passed during the 1926 and 1927 sessions has opened up a new era in agricultural education and a wider distribution of research into agricultural problems. It has been the aim of the Department to work in as close co-operation as possible with the two agricultural colleges, as well as with the Cawthron Institute and other establishments where work associated with the industries of the land is carried out.

THE FIELDS DIVISION.

The establishment of a plant-breeding and plant-disease research station on the Massey College land at Palmerston North has necessitated a considerable readjustment in connection with the Fields Division. An important section of this Division is the staff of the Biological Laboratory, hitherto housed in Wellington in premises which have become entirely inadequate. Moreover, the absence of available land for experimental purposes has become a serious drawback. It was therefore decided to avoid the expense in buildings and extra staff which would be involved by the erection of a new laboratory near Wellington, and to make such arrangements as would enable the new station at Palmerston North to be available for the Department's Biological Laboratory staff.

The Director of the Fields Division, while continuing to carry out the duties of this position, will act also as Director of the new station, and in order to enable this to be done efficiently the whole of the headquarters staff of the Division, as well as the Biological Laboratory staff, are being transferred to Palmerston North, where suitable office and temporary laboratory accommodation has been secured in the town. It is hoped that this arrangement will operate satisfactorily.

A readjustment of the field organization of the Division is also in progress, four district staffs being established each with a supervising officer in local control.

LIVE-STOCK.

The appended report from the Director of the Live-stock Division furnishes a comprehensive statement of the activities of that Division during the year, and of the position regarding live-stock and live-stock products generally. In the matter of animal health the position of freedom from many serious diseases has been maintained, while those diseases existing in the Dominion have been kept well under control.

The unusually dry summer brought about some falling-off of milk-yield in dairy herds, but this was compensated for to some extent by the favourable autumn conditions, and the total season's yield of dairy-products was a very good one. The average yield of dairy cows continues to increase, and the standard of quality of the dairy herds from a breeding viewpoint shows steady improvement.

The swine industry is growing, the number of pigs in the Dominion showing a notable increase. There is room for much improvement in swine-husbandry methods, and steps are in hand for establishing a more systematic instruction service in this and in animal husbandry generally. Apart from the feeding and management of pigs, more method in breeding is needed, so that a more uniform type can be produced for export purposes as well as for local needs. Seeing that the Berkshire breed is so predominant here in numbers, this need can best be met for the time being by crossbreeding with one of the best "long carcase" breeds.

The Rabbit Nuisance.

The great improvement in the rabbit position is most satisfactory. While fully appreciating the fact that the market value of skins and the consequent wholesale destruction of rabbits has been a very important factor, it must be realized that the work of Rabbit Boards in districts where they are established has proved a notable feature in assisting to bring this about, while the strenuous and long-continued effort of the Department's Inspectors must also be given its full share of credit. The officers responsible for the control of rabbits and noxious weeds, in addition to their stock-inspection duties, have had to carry out arduous and often unpleasant duties, and credit is due to them for the tact and firmness they have almost invariably displayed and the thoroughness with which their work has been done.

Noxious Weeds.

How best to deal with noxious weeds still constitutes an economic problem. Our Inspectors do their best, and farmers and others concerned have certainly shown a better feeling of co-operation, but a satisfactory solution yet remains to be found. A conference of North Island Rabbit Boards suggested that these Boards should also undertake noxious-weed inspection in their districts. The principle involved in this suggestion is well worth consideration, not only as regards its application to the localized districts covered by these Boards, but also from the wider standpoint of the Dominion as a whole. It is rather a big question, requiring careful examination in all its aspects.

The Veterinary Laboratory.

The Live-stock Division report contains a concise but comprehensive statement of the operations of the Veterinary Laboratory, at Wallaceville, and the officers responsible for it are to be commended for the volume of work done and its results, together with the high standard of efficiency shown in carrying it out. The results attained have brought about an advancement of our knowledge regarding some phases of obscure animal-disease.

The accommodation at the Laboratory is becoming somewhat cramped and more space will need to be provided, together with one or two additions to the technical staff, which have become necessary in order to enable the increasing work connected with disease-investigation to be prosecuted satisfactorily, and necessary associated work in the form of parasitology, biochemistry, and dietetics generally to be carried out in a more systematic and thorough manner.

An important feature of the year's operations lies in the organized attack upon those baffling dairy-cow diseases, contagious abortion, sterility, and mammitis. Commenced three years ago and carried on by the close association of field officers with the Laboratory staff, this has become more systematized, and now it has been arranged that two of the most capable field investigators shall devote themselves exclusively to research into these diseases in collaboration with the Laboratory staff, while the whole of the field staff of the Division will assist to the extent permitted by their regular duties.

Animal Husbandry.

Some temporary dislocation of the organization of the Animal Husbandry Branch, initiated early in the year, occurred consequent upon the officer in charge accepting a position at the Massey College. Steps have now been taken to establish this instruction service on a wider and more comprehensive scale than was originally contemplated, and it is hoped to be able to commence operations early in the coming spring.

The Dairying Industry.

The Director and officers of the Dairy Division have had a somewhat strenuous year. The initiation of the compulsory cream-grading system threw a great deal of additional work upon them, which, however, was facilitated by the co-operation and support of the great majority of factories. Some difficulties occurred, but having regard to the nature of the work it can be said to have gone through well. A point of some importance which was raised was that there should be two grades instead of three. It is considered, however, that the three grades should continue—at any rate, until they have had a thorough trial over a longer period.

It is satisfactory that the quality of butter has been maintained, and, in the case of a number of factories, improved. Cheese quality, however, has shown some falling-off in certain districts. The seasonal conditions have been an important factor in this, but the position is having full attention.

During my recent visit to the United Kingdom I was able to observe the work done by the Department's inspecting officers there. It is quite satisfactory, and of undoubted benefit to the industry.

Herd-testing has made marked progress, and the subsidy granted by Cabinet will be of valuable assistance in furthering this movement. The fact of much of the testing being in the hands of independent organizations renders it necessary for those controlling them to use every care to continue to employ reliable men to carry out the work and thus ensure efficiency generally. The upward tendency of the average dairy-cow yield is gratifying, and, while the instructional services of the Department can justly claim some credit for this, the herd-testing movement—originally started by the Department—has certainly been an important factor.

Farm dairy instruction has not made the progress one would like to see. This service is a most useful one, which can be credited with having been a marked factor in bringing about improvement in the quality of milk and cream sent to factories. It is hoped that the industry will co-operate with the Department in bringing about an extension of it.

For the purposes of the general current work of the Division a dairy bacteriologist has been appointed to work at the Wallaceville Laboratory, thus freeing the regular staff there of dairy work and facilitating the handling of the rapidly increasing volume of investigation which is being conducted. Provision has also been made for chemical assistance.

In co-operation with the Massey College Council, the Dairy Board, and the Research Department, steps were taken early in the year to establish a laboratory and an experimental dairy factory on the college farm. A committee, on which were representatives of all four bodies, was set up to generally direct the work of these places. A chemist and a bacteriologist, both highly trained men, have been engaged on the Committee's recommendation, while the factory will be under the direction of one of the senior Instructors of this Department. In view of this development, the erection of the Department's own laboratory and experimental factory at Wallaceville was not gone on with, accommodation being provided in the existing laboratory there for dealing with the Dairy Division's routine work. Every endeavour will be made to ensure that the whole of these arrangements work out satisfactorily.

Crops and Pastures.

The report of the Fields Division goes fully into the work done in connection with field crops and pastures. Investigations into troublesome diseases of cereals and roots are being actively prosecuted, field trials in some cases being carried out in association with the laboratory work.

The work initiated in Canterbury in connection with the certification of seed wheat and seed potatoes should prove of value to growers, and it it is a matter for satisfaction that they are cordially co-operating in it. The selection and breeding of improved strains of seed wheat at Lincoln College, in association with the Department, is making good progress, and an interesting development in connection with the wheat-growing industry has been the setting-up of a Wheat Research Committee to aid the Research Department in conducting research into wheat-growing and the manufacture of flour and bread. This is financed by means of levies upon wheat and flour. This Department, while naturally greatly interested in the research work to be done, is only associated with it by having a representative on the Committee, and when the scheme is in full operation it will be the desire of the Department to do all it can to assist in making it a success in practice.

As regards pastures, a large volume of work has been done, much of it in connection with the regrassing of second-class country in parts of the North Island. This is fully gone into in the divisional report.

The practice of fertilizer top-dressing continues to extend, having received a marked impetus from the reduced price of fertilizers which ruled for a considerable period, also from the reduced rates of railway carriage brought about by an arrangement with the Railway Department under which the Department of Agriculture was charged with a large share of the cost involved by the reduction. For the financial year this share amounted to £81,538.

The instruction service of the Division is still expanding in order to meet the continued and increasing desire of farmers for direct advice on the farm itself. This, combined with lectures, demonstrations, and the planning and supervision of experimental plots keeps the Instructors and their assistants fully employed.

The larger experimental areas conducted by the Fields Division have been employed principally for the purposes of field experiments in association with laboratory investigations,

and experiments or demonstrations bearing upon local farming conditions. They form useful adjuncts to the general instruction services of the Division.

At the Biological Laboratory a large range of investigation and general work has been carried out, as will be gathered from the detailed information furnished in the divisional report. It is satisfactory to note that the number of commercial seed-samples submitted for analysis shows a large increase.

The farm economics section of the Division is making good progress, and a great mass of data is being gathered, from which information not only of statistical value but also of practical value to farmers is already becoming available.

The Hemp Industry.

A moderate increase in fibre-production was recorded for the year, but, judging by an analysis of the grading returns, quality fell below that of the preceding twelve months. During the year an officer was detailed to carry out instructional work among the mills, and beneficial results may be expected from this service. The main phormium areas are reported as healthy. Financially this industry has been depressed owing to a fall in prices.

Fruitgrowing and Horticulture generally.

The fruit industry experienced a good year, and there seems every reason to believe that it is emerging satisfactorily from the somewhat depressed conditions existing previously. The export business proved a financial success, and practically no call was made upon the State guarantee. A satisfactory feature lay in the good marketing conditions obtained in South America, which indicate that with a continuance of efficient handling this outlet may remain a paying one for years to come. It is a matter for regret that the possibilities of the United States as a market for our fruit cannot be tested, owing to the prohibition of import imposed by the Government there. Tobacco-culture is making rapid progress and bids fair to become quite an important industry, provided a good enough and sufficiently stable market is found to exist when our production becomes greater than is needed for Dominion requirements. The instructional services of the Division functioned efficiently, and, as usual, were assisted by the hearty co-operation of fruitgrowers and others concerned. The Director of Horticulture, in his report appended, goes fully into details of the Division's activities.

Grape-growing.

Much of the grape crop produced is used for winemaking, but in the Auckland Province outdoor-grown table grapes are grown and marketed successfully. There seems no reason why table grapes of suitable varieties should not be grown in the North to a much greater extent than at present, so as to provide the consumers of the Dominion with fresh home-grown fruit in place of the imported variety.

Beekeeping.

This industry has maintained itself upon a good footing and continued to provide its quota of our export trade. It is satisfactory to note that the prices received for New Zealand honey in the United Kingdom are still on a high basis, comparing very favourably with those for honey imported from other countries. The maintenance of a high standard of quality, careful grading, and judicious advertising have no doubt been important factors in bringing this about.

The State Farms.

Ruakura.

This farm has experienced a good year, and it is gratifying to report that its position, from the financial standpoint, is steadily improving. For the year the total expenditure, excluding permanent salaries but including all expenditure upon the farm training college and other educational work, was £8,937, while the total receipts were £9,347. Permanent salaries, including instructional services, amounted to £3,582. The position is perhaps even better than these figures indicate, as during the year, as in the two preceding years, a greater proportion than hitherto of the annual expenditure has been in connection with improvements, particularly as regards pastures, fencing, and water-supply. Also, 12 acres of previously unimproved land were stumped, cropped, and laid down in grass. All the pastures on the farm are now in excellent condition.

A departure was made by holding the annual stock sale in August instead of in April. This proved a marked success, and the practice will be continued.

As regards sheep, the Southdown flock has done well, giving a lambing return of over 100 per cent. Rams sold well, realizing up to 11½ guineas and topping the market at the local ram fair. In addition to the Southdowns, a flock of 1,120 breeding-ewes is being carried, and good returns were obtained from the sale of both fat lambs and wool.

The production from the dairy herd was affected by the dry summer; nevertheless the returns will be up to the average of the two preceding years. A number of cows were put under the semi-official test, Jerseys, Shorthorns, and Ayrshires being included. One Jersey heifer was awarded the breed association's silver medal.

Unfortunately, the piggery building was destroyed by fire in March and a new building has had to be erected. Some ninety-five pigs were lost, but fortunately all the stud boars and all but five of the breeding-sows were saved.

The poultry section has been remodelled on modern lines, and now shows a small margin of profit after allowing for wages and all expenses.

The apiary has been the subject of special attention, and some changes in connection with it are contemplated. Six trainees took a course of instruction during the season.

Ruakura Farm Training College.

Some thirty-five students are in residence. The course, which was formerly one of two years, has now been cut down to one and a half years, though students can stay on for a full second year if desired. It seems evident that more publicity is needed in connection with this institution, which affords good facilities for lads to obtain a training in elementary agricultural science as well as in the practical side of farm-work. Lads of sixteen years of age or over are eligible, and the fees are only £36 per annum, in return for which comfortable quarters, good food, and sound instruction are provided.

Weraroa.

The unusually dry summer rather militated against the productivity of this farm, but apart from this a good season was experienced.

The herds of Friesian and Red-polled cattle have been maintained at a good standard, but the annual sale of young bulls and heifers proved very unsatisfactory, there being evidently a poor demand for breeding-stock of these types. Pigs sold readily enough, but at lower values than in the preceding year. The sheep-farming operations proved very satisfactory. The Ryeland flock has done well and should be a good asset to the farm. There was not, however, so strong a demand for rams of this breed as had been anticipated. New blood is needed as soon as importations from England are permissible. For the purposes of the grassland research carried on by the Fields Division 5 acres, divided into separate plots, have been sown down with specially selected seed.

During the year the total expenditure, excluding permanent salaries but including cost of experimental work, was £5,174, while the total receipts were £6,140. Permanent salaries amounted to £1,849.

As stated in previous reports, this establishment has served its purpose as an experimental farm, and there is nothing to be gained by the Department continuing to conduct it on its present lines. If it is to be continued, it should be completely commercialized and the overhead costs thereby greatly reduced.

Te Kauwhata Horticultural Station.

The main activity at this station continues to be grape-growing and winemaking, this being in a healthy financial position. During the year the vineyard was extended for the introduction of a number of European varieties new to this country. Additional cellar accommodation was also brought into use.

The wattle plantations were worked as usual for tanning-bark, and auxiliary income was also derived from selling waste timber as firewood. The considerable area of grassland was again utilized for sheep, with increased financial returns.

The total receipts of the station for the year exceeded expenditure, including permanent salaries, by £1,868.

Fertilizers.

The report of Mr. A. F. Ellis, New Zealand representative on the British Phosphate Commission, which is attached to this report, sets out in detail the operations at Nauru and Ocean Islands during the year ending 30th June, 1928. From this it will be noted that the total imports of phosphate rock from all sources exceeded those of the previous year by 29,713 tons.

Additional loading facilities, involving construction-work on a large scale, are in progress of installation at Nauru Island, and when completed, about the end of 1929, the output capacity of the island will be very materially increased. Improvements in the loading plant at Ocean Island are also in progress, and more are contemplated. The whole question of ensuring adequate supplies of raw phosphates is having very close attention.

In addition to phosphate rock, extensive importations of prepared fertilizers took place, the total quantity imported during the twelve months ending 31st March, 1928, amounting to 90,934 tons.

The Fertilizers Act passed last session is a marked improvement upon previous legislation. The necessary regulations in connection with it are in course of preparation, and every endeavour is being made to ensure that they will be satisfactory and sufficient in operation.

Publications Service.

This activity has been carried on efficiently during the year. The *New Zealand Journal of Agriculture* holds its place as the Department's leading means of publicity, and much valuable original matter has again been recorded in its pages. The *Journal* continues to feature both the semi-popular scientific and the more simple instructional sides in relation to the various branches of New Zealand agriculture. This well-considered and carefully prepared matter is freely at the disposal of the daily and weekly press of the Dominion, and articles are frequently reproduced by such newspapers. Apart from its large circulation among farmers, the *Journal* continues in steady demand by agricultural and kindred scientific institutions in all parts of the world. It thus helps to keep New Zealand "on the map" in quarters not reached by ordinary publicity material.

There has been an average output of bulletins and other instructional pamphlets during the year, while a number of miscellaneous departmental publications have also been dealt with.

Radio Broadcast Lecturettes.

During the year arrangments were made with the Radio Broadcasting Co. of New Zealand to supply a service of lecturettes on agricultural subjects, to be broadcast from their centrally situated station, 2YA, at Wellington. The educational or instructional idea is indicated by the general title given to the series—"For the Man on the Land." So far the addresses have been given on a regular evening once a week. A wide range of topics has been covered, all branches of the Department having contributed to the service.

Legislation.

During the 1927 session the following Acts associated with the Department were passed: Massey Agricultural College Act, 1927; Canterbury College and Canterbury Agricultural College Amendment Act, 1927; Howard Estate Amendment Act, 1927; Institute of Horticulture Act, 1927; Fertilizers Act, 1927; Noxious Weeds Amendment Act, 1927; Seeds-importation Act, 1927; Orchard-tax Act, 1927; Fungicides and Insecticides Act, 1927; Introduction of Plants Act, 1927; Finance Act 1927 (No. 2) (section 38); Stock Amendment Act, 1927; Slaughtering and Inspection Amendment Act, 1927; and Apiaries Act, 1927.

The Imperial Agricultural Research Conference.

Attached hereto is a report upon the proceedings of this Conference. As representing New Zealand, Mr. T. Rigg, of the Cawthron Institute, was associated with me. Mr. R. E. R. Grimmett, of the Chemistry Section of this Department (who was then on special duty in Britain) also attended the various meetings.

The Staff.

In conclusion, I must express my appreciation of the energy displayed and good work done by the whole staff during the year. In August I left the Dominion for the purpose of attending the Imperial Conference on Agricultural Research in London, and during my absence the control of the Department was in the hands of Mr. F. S. Pope, Assistant Director-General, to whom my thanks are due for the capable manner in which he carried this reponsibility. I must also record my sincere recognition of the assistance rendered throughout by the Divisional Directors and the Chief Chemist in maintaining the efficiency of the Department and its value to the various branches of rural industry.

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

NAURU AND OCEAN ISLANDS PHOSPHATE.

REPORT OF A. F. ELLIS, C.M.G., NEW ZEALAND COMMISSIONER, BRITISH PHOSPHATE COMMISSION.

THE eighth year of operations under Government ownership at Nauru and Ocean Islands terminated on the 30th June, 1928, the total shipments of phosphate being 501,915 tons, as compared with 593,340 tons shipped during the preceding year, or a decrease of 91,425 tons. Of this quantity, 124,270 tons came to New Zealand, the balance, 377,645 tons, going to Australia.

During the year under review operations at both islands were much impeded by bad weather at the season when it may normally be expected, though sometimes it is escaped. As is frequently the case, the rough seas then encountered carried away one of the sets of deep-sea moorings, and subsequently a vessel was wrecked at Ocean Island; both accidents caused considerable dislocation of shipping operations. There were also some labour difficulties, and an unfortunate epidemic of sickness at Ocean Island. In view of all these adverse circumstances, the shipment of 501,915 tons, as stated, must be considered a very satisfactory result, having been exceeded only in the previous year, when particularly favourable conditions were experienced throughout.

Deliveries and distribution of phosphate in the Dominion from Nauru and Ocean Islands, also from outside sources (Makatea and Morocco), for the last two years, are as follows:—

Port of Discharge.	Nauru and Ocean Phosphate.		Outside Phosphate.		Total.	
	1926–27.	1927–28.	1926–27.	1927–28.	1926–27.	1927–28.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Auckland	78,560	69,612	10,415	29,022	88,975	98,634
New Plymouth ..	14,346	18,882	..	3,322	14,346	22,204
Wanganui	11,879	20,342	..	3,050	11,879	23,392
Lyttelton	21,986	20,482	..	7,552	21,986	28,034
Port Chalmers ..	9,537	7,399	..	..	9,537	7,399
Bluff	3,227	..	..	..	3,227	..
Totals ..	139,535	136,717	10,415	42,946	149,950	179,663

The larger proportion of outside phosphate which it has been necessary to import during the year under review has been successfully handled by the fertilizer-manufacturers. By judiciously mixing it with the main supplies of higher-grade article from Nauru and Ocean Islands the standard quality of superphosphate has been maintained, and it is hoped that this desirable result can be continued.

For the current year the indications are that about 207,000 tons of phosphate will be required, in which case there will again be a material advance on the previous year.

In order to provide full supplies for the Dominion, even in the event of unforeseen difficulties at Nauru and Ocean Islands, purchases of outside phosphate have been made up to 1932, and options of further quantities have been obtained, to be exercised should it become necessary. In the phosphate market it is necessary to contract well on ahead.

The erection of improved shipping facilities at Nauru and Ocean Islands is proceeding satisfactorily, particularly at the former, where the work is of considerable magnitude. The loading cantilever there, and necessary plant to be used in conjunction with it, will probably not be completed until the latter part of next year. At Ocean Island the new steel jetty should be finished about the end of this year.

Satisfactory steamer rates have been secured during the year under review, and the freight market continues favourable. In obtaining good freights for the Dominion the rate of discharge becomes an important factor. Material improvement in this respect has been effected at Auckland during recent years, and the arrangements at Lyttelton are satisfactory. At the other ports where phosphate is discharged in bulk there appears to be need for better facilities, and it is suggested that the installation of these could well be considered by the authorities concerned, in view of the increasing quantities now being handled. The Commissioners' chartering operations will be greatly facilitated when an all-round improvement in discharge at Dominion ports is possible. The phosphate is sold at a flat price at the various ports, and it is desirable that the rate of discharge be brought to a uniformly high level.

IMPERIAL AGRICULTURAL RESEARCH CONFERENCE, LONDON, 1927.

REPORT OF THE NEW ZEALAND DELEGATES.

THE HON. THE MINISTER OF AGRICULTURE. Wellington, 14th June, 1928.

We have the honour to submit the following report on the Imperial Agricultural Conference :—

Recognizing the profound influence which agriculture is destined to play in the future in the promotion of the prosperity of the Empire and the happiness of its people, the Governments of Great Britain and of the Dominions have tried earnestly since the conclusion of the war to improve the status of agriculture in their respective countries. The importance of surveying the problems of agriculture throughout the Empire, of co-ordinating research work, of effecting a better utilization of the results of research, and of training efficient workers was recommended by the Imperial Conference of 1926 for the sympathetic consideration of the respective Governments of the Empire.

It was therefore not surprising that with the advent of the Empire Marketing Board and the stimulus given to agricultural research by its efforts the invitation of the British Ministry of Agriculture to the Dominions, Crown colonies, and dependencies, to send delegates to an Imperial Agricultural Conference in England met with ready acceptance from all parts of the Empire.

No effort was spared by the Ministry of Agriculture or the Empire Marketing Board, which defrayed the cost of all secretarial work and of the entertainment of delegates in England, to make the Conference in the highest degree successful. The Governments of the Dominions and the Colonial Office contributed in no small measure to the success by sending their representatives to attend the Conference and take part in its proceedings. The Conference was supported whole-heartedly by the agricultural-research stations of Great Britain, and every facility was granted overseas delegates to inspect the work which was being carried out and to discuss with the scientific staffs at these stations problems of mutual interest.

Too much stress cannot be laid on the value to agriculture which accrued from the opportunities thus afforded delegates of meeting one another and of discussing their work. In many cases it was realized, in some cases for the first time, that workers in other parts of the Empire were investigating similar or allied problems. Frequently a new approach to a particular problem resulted from the discussions which took place.

THE WORK OF THE CONFERENCE.

Early in the proceedings of the Conference it was clearly recognized that matters of broad policy affecting the development of agriculture in every part of the Empire deserved special consideration by the Conference as a whole. Such questions as follow were all matters of great importance to every part of the Empire, and were considered in detail by the Conference :—

(1) The establishment of Imperial bureaux and information centres for various branches of agricultural science.
(2) The collection and dissemination of information on agricultural problems throughout the Empire.
(3) The desirability of creating special research stations for the investigation of particular problems.
(4) The recruitment and training of agricultural workers.
(5) The establishment of permanent machinery which could conduct the secretarial work of the Conference and of other conferences which might be arranged in the future.

Specialist Commissions of technical and research officers met during the course of the Conference to consider the needs of agricultural research in different branches of agricultural science. Many valuable recommendations were submitted by these Commissions to the Conference.

Among the important matters which were considered in detail by the Administrative Commissions of the Conference, those relating to (1) the dissemination of information, and (2) the creation of Imperial bureaux and information centres were of great importance to all the Dominions.

In the past, agricultural officers in the Dominions have been dependent to a very large extent on the fundamental knowledge which has been gained by many famous research stations in Great Britain and Europe, often by prolonged and deep research, and Dominion workers have effected a practical solution of many problems confronting the agriculture of their countries by the application of such fundamental knowledge to their own particular conditions. While it is highly desirable that the value of fundamental research should receive the fullest recognition, direct attacks upon the great economic problems of agriculture in the Dominions must remain for many years the prime consideration of our workers. In the solution of such Dominion problems specific fundamental research will frequently be required, but the efficient application of existing knowledge must constitute the first line of attack.

In many cases it will be found that Dominion workers who are in touch with the progress of fundamental research in Great Britain and other countries will be able to suggest a practical solution of the problem confronting them. Full success in the solution of economic problems, however, is not likely to be obtained unless well-trained officers are available who keep abreast of the development of research work in other countries.

Co-operation in Agricultural Research.

One of the most valuable results of the Conference should be the co-ordination of agricultural research throughout the Empire. This should eliminate unnecessary duplication of effort, and should release both personnel and money for direct attacks on many economic problems which await solution.

The proposed Imperial bureaux and information centres should play an important part in economizing effort and in co-ordinating agricultural research. It was definitely recommended by the Conference that the bureaux and information centres should collect data and information in specific branches of agricultural science not only from all parts of the Empire but also from other sources throughout the world. One of the important functions of the bureaux and information centres will be the dissemination of this knowledge to individual workers in different parts of the Empire. In order that the greatest benefit may be secured from the work of the more famous research stations in Great Britain, it was recommended that the bureaux and information centres should be attached to particular research stations. This should ensure reliability in the information disseminated and help to bring about personal contact between overseas investigators and officers conducting research in Great Britain. It will be possible for the bureaux to establish contact between workers in different parts of the Empire who are investigating similar problems. By this means they will be enabled to compare notes and interim results. In such cases one might expect the development of new lines of approach to a problem, greatly hastening thereby its solution.

Where problems of general importance to several parts of the Empire are encountered arrangements will, no doubt, be made through the bureaux and information centres for a concentration of effort by some particular research station on such problems. Workers in other parts of the Empire would then be able to co-operate by the prosecution of research on some aspect of the problem which was of particular importance to their own country.

Co-ordination of research in the Empire cannot be attained without the support of scientific workers. The opportunities afforded by the Conference for discussions between workers from many parts of the Empire were of great value in establishing a real understanding between workers engaged on similar activities. The personal contacts made by Dominion workers should prove invaluable in the prosecution of their work. It will render possible much greater freedom of inquiry and of discussion.

The Conference unanimously endorsed the suggestion of periodical conferences for agricultural workers. In certain parts of the Empire regional conferences of specialist officers should prove of the utmost value.

Delegates were impressed with the importance of securing study-leave for isolated workers, and of facilitating an interchange of visits between workers in different parts of the Empire.

The recommendations of the Conference envisage the establishment of Imperial bureaux in the following branches of agricultural research :—

(*a*) Soil science. (Bureau to be attached to the Rothamsted Experimental Station.)
(*b*) Animal nutrition. (Bureau to be attached to the Rowett Institute.)
(*c*) Animal health. (Bureau to be established in London.)

In addition to these bureaux, the establishment of clearing-stations for information were recommended in the followng subjects :—

(*a*) Animal genetics. (Station to be attached to Animal Breeding Research Department, Edinburgh University.)
(*b*) Agricultural parasitology. (Station to be attached to the Institute of Agricultural Parasitology, London.)
(*c*) Plant genetics. (One station to be attached to the Plant Breeding Institute, Cambridge University, to deal with all crops of temperate and tropical regions except herbage plants.)
(*d*) Another station to be attached to the Welsh Plant Breeding Station at Aberystwyth to deal with herbage plants.
(*e*) Fruit-production. (Station to be attached to the East Malling Research Station, Kent.)

The subjects to which the proposed bureaux and correspondence centres have reference are equally important in their bearing on agriculture to all parts of the Empire. It is a matter of congratulation that in almost every case the bureaux and information centres will be attached to research stations where much active work on the particular subject to which the bureaux and centres have reference is being pursued.

The suggestion that facilities should be made available through these Imperial bureaux for the training of selected Dominion workers met with the hearty approval of the Conference, and will extend still further the valuable work which the proposed bureaux and information centres will undertake for the development of agriculture in the Empire.

Work of the Technical Committees.

Much valuable work was done by the technical committees which were established to consider the needs of research in different branches of agricultural science. Recommendations were made by these committees on the necessity or otherwise of creating clearing-houses for information in different subjects, on the functions of bureaux, and their organization to serve the special needs of different branches of science. Joint programmes of research between different parts of the Empire were considered, and the use of standard methods for experimental work was earnestly recommended.

Special problems requiring urgent consideration were brought to the notice of the Conference so that definite action could be taken by the responsible authorities.

C. J. Reakes.
T. Rigg.

LIVE-STOCK DIVISION.

REPORT OF J. LYONS, M.R.C.V.S., DIRECTOR.

Stock Conditions generally.

The past season taken as a whole throughout the Dominion can be regarded as a prosperous one, although a number of districts, particularly Auckland and Taranaki, suffered rather severely from the prolonged dry weather, with the result that, owing to the shortage of feed, many herds went off their milk long before their accustomed period. On account of the drought extending into the late autumn the prospect of winter feed in such districts is not good, and, as many of our dairy-farmers were compelled to use the feed saved for winter in the late summer and autumn, it will be somewhat difficult for them to carry their stock through the season in satisfactory condition, unless the winter is an exceptionally mild one.

Unfortunately, the loss sustained during the dry season is not the only one. Animals after such a season are badly fitted to withstand the cold and wet of the winter following, with the result that they come to their next calving-period in anything but a fit condition to give of their best. It takes months of feeding during the then ensuing season to enable them to do so, and by that time the best of the milking season is over. I would again emphasize the necessity for keeping dairy stock in good healthy condition all the year round, and more particularly at that period when they are turned out, by providing sufficient food and shelter to enable them to come to the calving-period in such condition that an adequate return can be expected from the start. Some of our dairy-farmers fully realize this. There are many, however, who do not, and on such I would impress the necessity for maintaining an adequate food-supply for their herds throughout the season. If the necessity for this could be fully realized it would increase our annual export in butter and cheese by thousands of pounds.

Notwithstanding the fact that the season was not an ideal one so far as the dairy-farmer is concerned, production has been well maintained, and is well up to the standard of previous seasons. Good prices have been obtained for wool, lamb, and mutton, and the yield for cereal crops in the Canterbury District has been well above the average. This should place such settlers in a sounder position financially and enable them to improve the carrying-capacity of their holdings.

The principal diseases and troubles affecting stock in New Zealand are dealt with under their respective headings as follows:—

Mammitis.—With the exception of the Auckland districts the incidence of this disease throughout the Dominion has been less than in previous years. In the above-mentioned district no decline is apparent, the position being similar to that seen the previous year. This is worthy of special mention, in as far as the vaccine treatment is concerned. Had the claims made for the use of vaccine been substantiated one would have expected to see a reduction in the number of cases, this being the district where vaccine was first and most extensively used.

It is to be regretted that scientific workers in this and other countries have, so far, been unsuccessful in finding either a preventive or curative treatment for this complaint. Although no effort has been spared in this direction, we are no further forward from a practical point of view than we were twenty years ago. We still have to rely largely on preventive measures, and on the dairy-farmer being willing to undertake these. Where adopted, good results have followed; but, as the District Superintendent, Wellington, remarks, such precautionary measures are not always persevered with, the dairy-farmer trusting to luck or the use of some proprietary medicine to carry him through the season.

With a view to acquiring further knowledge of this and other diseases affecting dairy cows, officers are being relieved from their ordinary duties, and in conjunction with the Laboratory staff at Wallaceville are spending the whole of their time in investigating new and better methods of treatment. It is to be hoped that their labours will be crowned with success, and should further knowledge be acquired by the scientific workers of this or other countries it will be made available to those engaged in our dairying industry.

Tuberculosis.—With regard to this disease the position remains much the same as formerly, as far as cattle are concerned. This year a slight increase, amounting to eighty-nine in number, has to be recorded over last year's figures of all tubercular cattle condemned in the field. The condemnation of cattle on clinical examination and as a result of the tuberculin test numbered 4,839, as against 4,750 last year. Taking the numbers as a whole throughout the Dominion, the position is very satisfactory, and the careful weeding-out of all clinically affected animals and the application of the test to all those that are deemed suspicious must, to a great extent, place the herds of the Dominion in a more satisfactory position than they otherwise would be. In the Wellington and Otago Districts a decrease in the number condemned has to be recorded—71 in each instance—while in Auckland and Canterbury an increase is shown of 217 and 14 respectively. The Auckland District again shows the highest percentage of condemnations, and this is not to be wondered at when one takes into consideration the conditions under which a number of the herds are kept. This district contains a large area of partially-drained swamp lands on which dairying is the principal asset. Strictly speaking, the areas are unsuitable for this class of farming, in the absence of a better system of drainage. The number of cattle examined at the freezing-works and abattoirs was 381,612, of which 19,476, or 5·10 per cent., an increase of 0·02 over last year, were found to be affected in varying degrees, a considerable number only very slightly. The total number of swine examined was 473,118, an increase of 54,802

over last year. The total number affected was 49,807, or 10·52 per cent., this being a small increase over last year. The increase is to be regretted, but when any one acquainted with the conditions takes into consideration the manner in which our pigs are housed and fed it is not surprising that considerable numbers become affected with this and other diseases. In another part of my report I have emphasized the necessity of providing better food and shelter for our swine, and unless farmers wake up to the necessity for this a still greater number of affected animals may be looked for. During the winter months the majority of this class of stock suffer so severely for want of proper attention that the resisting-powers are reduced, and they are unable to withstand infection. At the present time the slogan is for greater production along this line, and I can see no reason why this should not be accomplished if the producers in this country will only give a reasonable amount of attention to the feeding and management of these animals.

Actinomycosis.—The animals condemned and compensated for for this disease again show a decrease on the previous year's figures, the number condemned being 628, as against 689 the previous year, distributed as follows: Otago–Southland, 72; Canterbury–West Coast, 54; Wellington, 161; Auckland, 341. All districts shared in the decrease. Treatment for this disease in the early stages with potassium iodide is being largely availed of, with very satisfactory results.

Malignant Growths.—The number of cattle condemned by Inspectors for malignant growths was 480, being an increase of sixty-five over last year's figures. The practice of confirming the clinical diagnosis by subjecting specimens to microscopical examination at the Veterinary Laboratory was again carried out in all cases where it was convenient to take specimens for the purpose.

Genital Diseases.—(*a*) Contagious abortion: This disease, although seen in almost every dairying district throughout the Dominion, does not cause the extensive damage it did a number of years ago. Although a few herds may suffer severely, it seldom assumes the epidemic form as seen in previous years. This is, no doubt, due to a certain amount of immunity being acquired. Advice with reference to the prevention of this disease has been freely given by the various officers, and large numbers of blood-samples have been collected and forwarded to the Laboratory at Wallaceville for identification purposes, farmers availing themselves freely of the opportunity offered in diagnosing the complaint. During the season 1926–27 experimental work was carried out in the field with Bevin's anti-abortion vaccine, an account of which is given in the report of the officer in charge of the Veterinary Laboratory, Wallaceville.

(*b*) Temporary sterility: This trouble still continues to be widespread throughout the districts where dairying is extensively carried on, and is a great source of loss and annoyance to the dairy-farmer, caused by the fact that a high percentage of the cows do not become pregnant until late in the season, and are correspondingly late in calving the following year. Under such conditions the dairy-farmer is unable to make the most out of his pastures, as they are being eaten by cows heavy in calf, non-producing, and by the time they have calved the spring feed has almost disappeared. Consequently good returns cannot be looked for from such animals, although this may not be due to any fault in the individual cow. Our investigation and experience so far have not been of such a nature as would justify the officers of the Division in stating that the disease is due to any one cause, but rather leads us to believe that there are a number of different factors which can cause the trouble. Further investigation is an urgent necessity, and this will be vigorously pursued during the coming season by the various officers set aside for this special duty. With the view of ascertaining to what extent mineral deficiency in pastures bears upon this complaint, a feeding experiment was carried out in the Wairarapa. Four herds were chosen, and in each case the herds were divided equally. One half, in addition to the pastures, were fed on a specially selected diet, in some instances containing minerals, while the other half were kept as controls and fed entirely upon the pastures. Briefly, the results were not beneficial as far as sterility was concerned. The experiment, however, demonstrated the beneficial results of feeding concentrates even when the natural food was plentiful. The milk-yield was increased to such an extent that it paid for all the concentrates consumed and left a considerable balance.

Blackleg.—The position in recent years with reference to this disease has become less acute in both the Taranaki and Auckland Provinces as a result of the campaign carried out by officers of the Division over a period of years, and consequently with considerable benefit to the farmers, while satisfactorily safeguarding the position. A slight increase in the number of deaths from this cause is reported in the Franklin and Whangarei districts, while a considerable decrease has been noted in the Taranaki District. At the present time inoculation is only carried out on those farms where the disease is known to exist, and on all young stock leaving the respective districts. Entire satisfaction is experienced with present methods for controlling the disease; this, while safeguarding the health of our stock is an enormous saving of labour to the Department and stockowners generally.

Parturient Eclampsia.—During the early spring months a number of outbreaks occurred from this cause in various parts of the Dominion. Two herds were affected in the Wairarapa district, several cases were reported from Marlborough, and in the Waikato the disease almost assumed epidemic propensities. The disease makes its appearance up to three weeks after calving. In some cases the animals drop dead, while in others they go down and die within a few hours. As this disease has only been seen in this country within the past few seasons, and only in a few isolated cases, there has not been much opportunity for investigation into the matter. A suggestion comes from abroad that the condition is in some way associated with the calcium contents of the blood. Further investigation into the cause of the complaint is necessary.

Staggers in Cattle.—This is a condition which was seen in almost every district in the North Island in the late autumn on pastures where rye-grass predominates. It is manifested by a peculiar nervous condition with muscular inco-ordination. The District Superintendent, Wellington, remarks, "Investigation leads to the opinion that one of two factors influence its production—viz., either a toxin in the rye-grass itself, or a stage in the development of the ergot." With this opinion I agree. Investigation was carried out at Wallaceville with a view to estimating the cause, but so far the opportunity for carrying out research in this direction was limited by the short period of the duration of the trouble. Affected stock in most cases made a quick recovery when given a change of pasture or when the autumn rains brought on a new growth. This complaint is not a new one, it having been seen previously in various districts through the Dominion, and always under similar circumstances. A number of years may elapse before the combined circumstances are again such as will produce the conditions. On this account opportunities for further research into the cause of the disease must be limited. A change of feed or autumn rains speedily bring about a cessation of the symptoms.

Mortality due to Dietetic Causes.—A number of cases of impaction of the stomach in cattle occurred in several districts. This was due to the animals being compelled to exist on dry, innutritious feed, and on account of the dry season such conditions were somewhat prevalent. A number of these cases ended fatally before the owners realized the cause, but it is remarked by the Veterinarian at Stratford, "if taken in time the majority of cases yielded to treatment."

Cattle-tick.—An increase in the infestation of stock with cattle-tick is reported from the Whangarei, Tauranga, and Coromandel districts. With the exception of the foregoing, the indications from the remainder of the affected districts are that ticks are decreasing. In the infested area at Waitara the position this season is very satisfactory, only one tick having been found during the year. Indications at present point to the fact that there is every prospect of ticks being eradicated from this district. I regret to report, however, that a fresh outbreak occurred on a farm at Tataramaka, situated on the coast about twenty miles south of Waitara. Every precaution was taken to prevent the spread of the ticks, by spraying the stock, ploughing, and cutting and burning the scrub. As regards the Poverty Bay district, on farms situated from Tolaga Bay northwards, it may be mentioned that at a meeting of the settlers, convened by the Department, held at Tolaga Bay in January, arrangements were made to extend the area A boundary to a few miles south of Tolaga, while at the same time B boundary was extended to provide a good buffer area between the infected and clean country. Both sheep and cattle dips are in process of erection, and no stock will be permitted to leave the district without a permit. By this means it is hoped to protect clean areas from infection.

Ragwort Poisoning.—This is a condition which still exists in many districts, more particularly in Southland and the King-country. The deaths arising from this cause have assumed no great proportions on any one farm, yet if taken collectively they would amount to considerable proportions. The weed is poisonous to all classes of stock, and its control has become a matter of considerable difficulty on properties where it has obtained a hold. Probably the best method of control is by a judicious pasturing of sheep on the affected areas. Care, however, needs to be exercised to see that the sheep are not kept for too long a period on the infested pastures, otherwise mortality is sure to follow.

"*Bush Sickness*" *or Soil-deficiency.*—As stated in my last report, we have now reached the stage in farming this particular type of country where we are justified in looking for fairly satisfactory results. With judicious manuring and top-dressing, the growing of root crops and the saving of hay, together with the use of citrate of iron and ammonia as a curative agent when an animal becomes sick, or as a preventive, is practically all that is required for successful dairy-farming. This method of farming bush-sick country has met with a considerable amount of success; in fact, greater than was anticipated some years ago. Any ordinary intelligent farmer with a knowledge of this country could take over the Government farm at Mamaku and run it as a dairy farm with every prospect of his operations meeting with success. In the light of our experience, however, we are hardly yet justified in advising settlers to take up this land as a farming proposition. Personally, I would hesitate before giving such advice, on account of the fact that too much capital and time would have to be spent in bringing the land into the condition where stock can be carried at a profit, and during this period the occupant has to live and spend more money than the soil produces. What is wanted is some cheap method whereby the land can be brought to a state where it will carry stock with a reasonable amount of success and afford the settler a living at the same time. It has been proved that the above-mentioned iron salt acts as a curative agent when cattle are suffering from bush-sickness, but it has not been proved that the addition of iron salts to the soil will act as a preventive. It has been demonstrated that top-dressing with suitable phosphates will, in time, give fairly satisfactory results, but the process is too slow and costly for the average settler, who must get a living from the land. As stated previously, a cheap method is wanted, and if this can be attained by the aid of iron salts to the soil without the addition of phosphates, then a better future can be predicted for this bush-sick country. Further experiments in this direction are being carried out.

Sheep.

During the past season sheep have done exceptionally well throughout the North Island, and fat lambs have arrived at the various freezing-works in greater numbers than for some years past. It is claimed in the Auckland District that the season just ended has been one of the best experienced so far, and fat-lamb buyers report that they have been able to buy better-finished lambs than usual. This is accounted for by the dry season experienced in the North, which suited sheep. At shearing time the ewes were noticed to be in first-class condition, which enabled them to bring a large percentage

of fat lambs forward. The season this year in the Canterbury District was not ideal for the production of fat lambs. In the early spring months the pastures were kept in a moist conditions by incessant rains, and in the latter end of the season an abundant growth of soft watery grasses was in evidence and neither condition is suitable for the production of fat lambs. On this account the number of fat lambs coming forward to the freezing-works was considerably less than for some years past. Those which did come forward were not in as good condition as formerly, and a larger proportion than usual were graded as second grade.

Parasitic Gastritis.—This complaint was fairly prevalent during last winter in practically all sheep districts throughout the Auckland Province. It was also seen in the Wellington District and Marlborough, and in a few instances fairly heavy mortality resulted. The wet winter was largely responsible for this. Advice as to the treatment and management of the flocks was given in all cases. In those instances where flockowners adopt preventive measures for the control of the parasite they are not troubled by losses to the same extent.

Liver-fluke.—During the winter a considerable amount of trouble occurred in the Hawke's Bay District on account of sheep being infested with this parasite. Instructional work in fluke-control has been continued during the year, including drainage, the dressing of swampy lands, and the dosing of sheep. Owners are adopting the instructions given, and are deriving considerable benefit therefrom. The work will be continued during the coming season.

Lice.—During the past season there has been an increase in the number of sheep exposed for sale affected with lice. This was more particularly in the North Island, and far too many prosecutions had to be taken. No doubt the dry season and the consequent shortage of water was to some extent accountable for this. Still, it would appear that the dipping had been carried out in a more or less perfunctory manner, and was done more to comply with the Act than to rid the flocks of these parasites. If the practice of exposing lousy sheep for sale is to be stopped—and it is my intention to see that this is done—more stringent measures will have to be taken. The ordinary prosecution does not seem sufficient to stop the practice. In future it is intended to stop the sale of all lice-infected sheep, to be followed by a prosecution, and in the case of second or subsequent offences a heavy penalty will be asked for.

Renal Congestion in Lambs.—A few cases of this trouble can be observed in all sheep-farming districts throughout New Zealand, but, with the exception of Central Otago, Southland, Oamaru, Timaru, and other parts of Canterbury, the mortality does not assume proportions which may be considered serious. In these districts, however, the mortality in many instances is of such a nature as to seriously interfere with the returns obtained by the farmer, who, I may add, is looking to the officers of the Division for some measure of relief. Officers have been working strenuously for the past two seasons with a view to elucidating the cause. So far, however, the major part of the investigations have been negative. From the experience gained it is thought that flushing the ewes before lambing with medicinal licks, green oats, &c., will afford some measure of relief, and to this end a number of experiments are being carried out by the farming community in various parts of the district. The results will be carefully observed, and should any of the methods prove satisfactory the information will be made known to all interested sheep-farmers.

Dipping.—From all parts of New Zealand reports have come to hand indicating that sheep are being dipped in a careless manner, and that the dips have not answered the purpose for which they were intended—viz., freeing from lice. Under such circumstances sheepowners invariably blame the dips as being ineffective. I am satisfied that in a large majority of cases it is not the dip that is at fault, but the manner in which it is mixed or dissolved. There are a large number of dips on the market that, when properly mixed with soft water in a bath that has been thoroughly cleaned, will do excellent work in freeing the sheep from lice and ticks. If sheepowners would see that this is done, fewer complaints would be made with reference to the ineffectiveness of dips. From the Canterbury districts reports were received that a considerable amount of mortality had been observed in a number of farms among stsheep that has been recently dipped. Again the dipping-fluid was blamed. On investigation, however, it was found that it was the first mixing of the dip for the season, and the first sheep that were put through the dip were the ones to suffer. On post-mortem examination it was found that the sheep had died from inflammation of the lungs, and, in some instances, the stomach and intestines, thus clearly showing that the dip had not been thoroughly mixed, and that some of the poisonous material was floating on the top of the water and had been swallowed by the sheep. With such mixing, even if not swallowed, there is always a liability of the sheep becoming scalded. It is to the interest of all sheepowners to see that the dip is mixed satisfactorily.

Maggot-fly Infestation.—During the season this trouble was more prevalent than formerly, and has spread over a wide area. It is chiefly confined to the northern part of the South Island, but was also noticed in the Fairlie district. It is to the interest of all flockowners to see that their sheep are kept well dagged, and as free from dirt as possible during the period when the fly is active, as it is well known that filth adhering to the fleece in the shape of dags, &c., attract the fly. Careful examination and dressing the flocks at intervals is also essential. Dipping of the flocks is also a factor in its control. All carcases on the run should be destroyed.

Pigs.

To any one who is familiar with the pig industry of this country it is obvious that if we are to gain a place in the world's market with the products thereof we must materially alter our system in the management and feeding of this class of stock. Pigs, if properly fed and sheltered, will thrive

excellently in the open during the summer months. Such animals, however, are born in mdiwinter or early spring, and it is then that they require most attention if the best is to be got out of them. It is well known that the better an animal is fed and cared for during early life the sooner it will reach maturity, and if through any cause a check is received it may take weeks for the animal to recover, during which period it is being fed at a loss. It is essential, therefore, that every farmer should keep his pigs going well from the time they are dropped. To do this, however, good housing-accommodation (a liberal supply of bedding is required so that the young animals may be kept warm) must be provided for the farrowing sows, and when reared the young animals must still be housed and given suitable food until such time as weather conditions allow them to be turned into the open. Skim-milk when fed alone is not a balanced ration; too much of this material is required to bring a pig to maturity. With the addition of concentrates the milk required for one animal could be made to feed two, thus showing a handsome profit for the extra food consumed. When pigs are reared in large numbers in a given space a certain amount of disease is difficult to avoid, but given good conditions for feeding and housing the mortality amongst pigs would be nothing like it is at present. Improved conditions mean increased profits, an object which should be held steadily in view. Pigs should be looked upon as a valuable asset whereby our by-products can be turned into a handsome profit, not as a medium for getting rid of such products. If this is kept steadily in view it will be a step in the right direction.

During the year a considerable amount of pneumonia was seen, more particularly in the North Island. The mortality has been heavy, and when one takes into consideration the individual losses it would amount to a considerable sum in the aggregate. When once an animal has contracted the disease it seldom does any good, and in most instances had better be destroyed. This trouble is caused by the conditions under which the pigs are kept. As stated previously, if proper shelter and food were provided the number of outbreaks would be negligible. When the advice of Departmental officers is sought they are often at a disadvantage, as there are no means on the farms for providing the necessary materials for treatment—neither food nor shelter. Improvement is urgently needed in the management and feeding of our pigs.

A number of cases of paralysis were seen in the various dairying districts, and from experiments carried out at the Wallaceville Laboratory it would seem that the feeding of the animals was at fault. Animals that were fed with a moderate quantity of cod-liver oil in their feed made a good recovery. Probably there were other ingredients lacking. Further experiments will be carried out along this line.

Instruction in the direction of bringing about improved conditions of housing, management, feeding, &c., with a view to the further development of the pig-export industry, has been given during the year by the Instructor in Swine Husbandry (Mr. K. W. Gorringe). The development of this industry has, however, been somewhat affected by the fact that the price offering for frozen pork in London has not afforded sufficient inducement to producers to largely increase their output, and the immediate prospects do not encourage other than slow but steady progress along safe lines, in order that a footing may be obtained and a demand created.

During the latter part of the year a number of stud animals of the Large White, Berkshire, and Tamworth breeds were imported from Canada, and these importations should have a good effect on our pigs in the future.

In order to assist in the development of the export trade the Government decided to render some financial assistance, which ultimately took the form of a payment of ½d. per pound in reduction of the freight charges to London. This is now in operation. The number of pigs recorded as slaughtered at registered establishments during the year was 498,022, being 56,563 in excess of the previous year. The exports during the same period showed an increased value of £69,524 compared with the same period last year.

Animal Husbandry Branch.

In order that the present-day needs of the farmer, particularly the small farmer, in respect to the feeding, breeding, and general management of his stock might be met, an Animal Husbandry Branch of the Division was set up during the year, with Mr. J. McLinden, M.R.C.V.S., N.D.A., as officer in charge. This is a work of the greatest importance to many of the farmers of to-day, who are at a disadvantage in not having the experience of lifelong connection with live-stock management, which was so large a factor in the success of our farmers of the past. The development of this Branch has received a temporary check by the appointment of Mr. McLinden to the staff of the Massey College, but it is proposed to go ahead with this new work and have an organization capable of meeting the needs of the time.

Live-stock Statistics.

Sheep.—The returns of sheep held in the Dominion as at the 30th April, 1927, showed the flocks to have increased by 744,023. The number of wethers and dry ewes held at that date shows an actual decrease, but the number of breeding-ewes shows an increase of 883,478, the number representing 57·8 per cent. of the total flocks, which is the highest figure yet reached in the history of the sheep industry in New Zealand. The number of lambs slaughtered at freezing establishments for the year under review reached 5,776,321, an increase of 432,555. These figures do not represent the slaughtering for a complete season, as the period covered embraces a part of two seasons, but it closely coincides with the taking of the sheep returns, and in that respect the comparison is of value.

The number of sheep as at the 30th April, 1927, is shown in the table hereunder, together with those for the previous four years :—

Year.	Stud and Flock Rams (Two-tooth and over).	Breeding-ewes.	Other Sheep.	Lambs.	Total.
1923	330,055	13,063,003	3,369,559	6,318,822	23,081,439
1924	332,814	13,076,097	3,853,482	6,513,386	23,775,776
1925	355,579	13,715,223	3,947,429	6,529,724	24,547,955
1926	370,535	13,948,252	4,292,056	6,294,036	24,904,993
1927	388,274	14,831,730	3,906,665	6,522,347	25,649,016

Cattle.—A further decrease in the total number of cattle is recorded, but although the dairy cows participate in the reduction the figures show the decrease to be 611 only. The following table shows the position under the respective classes, together with the previous four years' figures :—

Year.	Bulls.	Dairy Cows.	Other Cattle.	Total.
1923	60,154	1,248,643	2,171,897	3,480,694
1924	58,934	1,312,589	2,192,074	3,563,497
1925	59,820	1,323,432	2,120,492	3,503,744
1926	58,853	1,303,836	2,089,777	3,452,466
1927	58,842	1,303,225	1,895,662	3,257,729

Swine.—An increase of 47,609 in swine has taken place, the total number as at 31st January, 1927, being 520,143.

Horses.—Horses again show a decrease, the 1927 figures being 303,718, a decrease of 11,514.

Slaughter of Stock.

Another excellent lambing season was experienced, and a record number of lambs resulted. The early weather conditions were favourable for fattening, and the early lambs did well, particularly in the North Island ; but the spell of hot dry weather which set in after Christmas somewhat delayed the fattening process, particularly in Canterbury. The number of lambs slaughtered, however, as will be seen, constitutes a record, and had a normal season been experienced over 6,000,000 lambs would have been slaughtered. The slaughter of sheep shows a slight decrease, but swine, calves, and cattle all show very substantial increases. Prices to producers have, on the whole, been favourable.

The following table shows the stock slaughtered during the past year at freezing establishments only. The previous year's figures are also shown :—

Stock.	Year ended 31st March, 1928.	Year ended 31st March, 1927.	Increase.	Decrease.
Cattle	220,831	163,268	57,563	..
Sheep	2,300,069	2,409,396	..	109,327
Lambs	5,776,321	5,343,766	432,555	..
Calves	120,015	57,791	62,224	..
Swine	259,114	201,766	57,348	..

For the purposes of comparison the following table shows the killings of sheep and lambs at meat-export slaughterhouses over four periods—1st October to 31st March in each year—as indicative of the slaughterings from the beginning of each season to the 31st March :—

Stock.	1924–25.	1925–26.	1926–27.	1927–28.
Sheep	1,821,901	1,654,489	1,729,963	1,580,024
Lambs	3,360,761	3,574,508	3,806,498	4,093,750

These figures show a decreased slaughtering of sheep of 149,939 and an increased slaughtering of lambs of 287,252 for the period 1st October, 1927, to 31st March, 1928, compared with the same period for the year 1926–27.

The following are the numbers of each class of animal slaughtered under direct inspection during the year ended 31st March, 1928 :—

Cattle	381,612
Calves	161,287
Sheep	2,942,076
Lambs	5,907,226
Swine	430,563

The following table indicates the respective class of premises at which these animals were slaughtered :—

Stock.	Abattoirs.	Meat-export Slaughterhouses.	Bacon-factories.
Cattle	160,781	220,831	..
Calves	41,272	120,015	..
Sheep	641,907	2,300,069	..
Lambs	130,905	5,776,321	..
Swine	121,763	259,114	49,686

Stock slaughtered at ordinary slaughterhouses during the year ended 31st March, 1928, was as follows :—

Cattle	81,076
Calves	1,993
Sheep	238,378
Lambs	25,211
Swine	24,834

In addition to the stock slaughtered at meat-export slaughterhouses, abattoirs, and ordinary slaughterhouses, 42,625 carcases of pork killed and dressed by farmers and sent into butchers' shops were examined by departmental officers.

In connection with animals shown in the table as slaughtered at meat-export slaughterhouses, the following numbers of the respective classes are returned as having gone into consumption within the Dominion :—

Cattle	45,644
Calves	7,269
Sheep	158,757
Lambs	64,571
Swine	28,145

Compensation paid for Stock and Meat condemned.

Compensation to the amount of £15,449 15s. 6d. was paid out during the year for 5,811 animals condemned in the field for diseases under the Stock Act, and £15,627 3s. 2d. for carcases or parts of carcases condemned for disease on examination at time of slaughter at abattoirs and meat-export slaughterhouses, &c., under the provisions of the Slaughtering and Inspection Act.

Importation of Stud Stock from Abroad.

The embargo on cattle, sheep, and swine from Great Britain owing to the presence of foot-and-mouth disease has had to be continued during the year, and, unfortunately, outbreaks of the disease are still being reported. With a view to facilitating the export of stud stock from Great Britain, the establishment of quanrantine stations has been undertaken by the Empire Marketing Board, and it was anticipated that the facilities thus provided would be taken advantage of by importing countries, and the export of stud stock from Great Britain revived. This is a matter which requires to be given careful consideration before we agree to remove our present absolute prohibition. During the year regulations were gazetted permitting the introduction of cattle from the United States of America, and of swine from Canada. The prohibition on swine and cattle from Australia still operates. The following is a summary of the various classes of animals which have entered into quarantine during the year: Horses, 2; cattle, 3; swine, 40; dogs, 68.

Exportation of Stud Stock.

The export of stud stock from New Zealand still shows some promise of growing. The following are the particulars of stud stock exported during the year: Sheep, 6,287; cattle, 184; horses (draught), 13. In addition, a number of trotting and thoroughbred horses were shipped to Australia, principally for racing purposes.

Destruction of the Kea.

The subsidy of 5s. per beak paid for the destruction of the kea totalled £763 5s., equal to 3,053 birds.

Inspection of Dairy Premises supplying Milk for Direct Consumption.

This work has been carried on satisfactorily during the year, and no untoward circumstance has eventuated requiring special mention. It is to the credit of the Dairy Inspectors that in recent years there has been a general improvement in the condition and cleanliness in which this most important food product reaches the consumer, and I feel sure that the energy displayed by our Inspectors will enable them to maintain the position, and even improve upon it. To do this, however, the strictest attention to duty is necessary. The Inspector must see that the sheds and surroundings are kept in a sanitary condition, that the hands of the milker, udders of the cows, milking-machines, and all utensils used in connection with dairying are kept scrupulously clean, if the milk is to stand up to the

reductase test. In addition to this, he must see that the milk is derived from healthy animals to avoid the risk of infection. With this end in view, all sheds, utensils, &c., are periodically examined, and with the assistance of our veterinary officers the herds are all clinically examined for disease, special attention being paid to the udder. Any suspicious animal is set aside, and a further test applied by means of the tuberculin test. Composite samples of milk are also taken and sent to the Veterinary Laboratory for examination for the presence of tubercle bacilli, and it is satisfactory to record that out of 295 samples examined during the year none were found to contain the bacilli.

Importation of Animal-manures.

It is now nearly twenty-five years since the importation of animal-manures into New Zealand was prohibited from all countries, with the exception of Australia and India, which were the chief sources of supply of animal-manures, and in which countries this Department inaugurated a system of licensing and inspection of the sterilization of animal-manures intended for shipment to New Zealand, with a view to prevent the introduction of such diseases as blackleg and anthrax through the medium of such manures. This system has stood to the present, but for some years past the demand for animal-manures from abroad has decreased to the vanishing-point, with the result that the inspection has been carried on at a loss. As a result of this position it has been arranged to withdraw the inspection from Australia, while the position in regard to Calcutta, where the cost is also considerable, required to be given consideration in the same direction.

Poultry Industry.

This industry is showing signs of greater confidence and stability than for some years past, and, having now reached the stage when it is producing in excess of local requirements, the matter of setting up a regular export trade is one requiring very careful organization with a view to establishing a sound connection for the future, and at the same time not interfere with the local market. A market is available in London during the months of October to December, and, as the months of September to November are our heaviest producing months, the London market is the one offering the greatest prospects, and should be developed. There should be no fear on the part of local consumers that export will mean dearer eggs, as to bring about export there must be increased production, and, seeing that an export market is only available for a few months, more eggs will be available throughout the remainder of the year.

The poultry-breeding and experimental station at Wallaceville is now sufficiently established to enter fully into the objects for which it was established, and already a keen demand has set in for birds and sittings of eggs.

I append the report of the Chief Poultry Instructor, Mr. F. C. Brown, as follows:—

During the past year the poultry industry has made satisfactory progress as compared with the previous period. Food-prices have ruled on the high side, but fortunately for the producer the average return for fresh eggs for the greater part of the year has been on a satisfactory basis. In Wellington the average price paid to the producer for the year was in the region of 2s. per dozen. The worst feature in connection with the industry is the lack of organization among producers. There is a genuine desire, and effort, being made on the part of many producers to bring about organization, whereby poultry-products would be centralized on the main marketing centres, in order that all unnecessary costs might be eliminated between the producer and consumer. At present the marketing of poultry-products is chiefly controlled by merchants. Even some of the largest producers, with big monetary interests at stake, fail to realize the necessity for joint action in catering for the export trade.

A matter calling for serious consideration for the welfare of the industry is legislation to prevent the adulteration which takes place in regard to certain poultry-foods on the market. Some of the ground food-materials sold to poultry-keepers are not by any means what they are represented to be. Particularly does this effect the small poultry-keeper, who usually has not the necessary machinery to grind his own grain.

The egg-laying competitions, which are assisted in many ways by the Department, are rendering the industry excellent service in developing the laying-power of certain breeds of poultry. Much is also being done towards the maintenance of breed type. Furthermore, the weight of the eggs laid by the respective birds is taken into account. At one time the number of eggs laid was the only consideration; but now a bird is not only required to lay a given number of eggs, but in addition these must be of good size and quality for the chief honours to be secured.

The poultry-breeding and experimental station at Wallaceville is now fully stocked. It is expected that in the near future uniform types of the breeds kept will be available in order that experiments may be conducted relative to feeding, &c., which will disclose conclusive results. During the forthcoming breeding season it is proposed to conduct some research work relative to artificial incubation and breeding, with a view to ascertaining the probable cause of poor hatches, also mortality during the brooder stage. The station is laid out on up-to-date lines. The great objective aimed at is the maintenance of constitutional vigor in the stock and economy in labour in attending to the birds. Obviously, a plant of this description will prove of educational value to those poultry-keepers who visit it, whilst, best of all, it has acted and will in the future act as a means of increasing the knowledge of the Poultry Instructors, which in turn can be passed on to producers.

As regards the future development of the industry, this will largely depend on the available food-supply, its cost, and whether or not a better system of organization is brought about among producers than that which exists to-day. During the year the Poultry Instructors have had their time fully occupied in complying with the many requests for their services.

The Wallaceville Veterinary Laboratory.

It is pleasing to report that the work of this Laboratory is still on the increase. From this it must be assumed that the work carried out there is becoming of greater service to the farming community. Each season of the year brings its own disease, and in many instances the period at the disposal of the staff for investigating the trouble is limited, and for want of further material it frequently happens that the work has to cease for the time being. This, of necessity, prolongs the investigation.

The following is a summary of the operations carried out by the Officer in Charge, Mr. C. S. M. Hopkirk, B.V.Sc. (Melb.) :—

A total of 4,685 specimens were received, as against a total of 3,292 for last year. The majority were milk and blood samples, but some 900 were specimens of a pathological nature, a big increase over previous years. Details of specimens are given below along with experimental work for the year.

Mastitis (Mammitis).

During the year 1,835 milk-samples have been examined. Of these, 1,032 (56 per cent.) were considered streptococcic in origin, while the remaining 789 samples were normal. There were fourteen samples, however, which were definitely due to organisms other than streptococci. These organisms were *B. lactis aerogenes*, *Staphylococci*, and *B. hyogenes bovis*. Experimental work was continued whenever possible throughout the year on mastitis.

B. lactis aerogenes.—One cow was given an injection of a culture of *B. lactis aerogenes* obtained from a sample forwarded from the Palmerston district, where several cows had died from mastitis. In the experimental case the quarter became intensely inflamed. The cow almost at once became visibly ill, and the temperature remained high. A small amount of thin amber-coloured secretion obtained was full of bacilli in pure culture. The quarter did not become gangrenous, but the organisms present set up such a toxæmia in the patient that she refused food, gave no milk at all, and could scarcely walk. She was finally killed. Besides udder-changes, the liver had developed numerous small necrotic areas throughout, about 2 mm. in diameter. The kidney showed a parenchymatous nephritis, and the heart endocardial hæmorrhages.

Streptococcus lactis.—More than one attempt was made to set up a lasting mastitis with *Streptococcus lactis*. This was found to be impossible. A passing inflammation did occur when milk-cultures, pH of 4·7, were placed in the quarter, but this soon cleared. Milk from an infected quarter placed in a second good quarter was found in one case to set up a further slight inflammation, but this was not the result in other trials. One would judge from the result that the saprophytic *Streptococcus lactis*, purely from acidity produced in culture, could set up an inflammatory reaction, but that the organism produced no aggressin with which to cause the tissues of the host to react. A sterile acid fluid was found to be equally effective in producing a passing inflammation of two or three days' duration.

Longevity of Streptococcal Infection.—During these experiments it was found that the usual form of streptococcus associated with mastitis had, on occasion, a longevity not before actually noted. In milk-transfer from one cow to another it was found that the streptococci had lasted three years in a quarter, the only sign being a slight leucocytosis in the milk secreted. This shows the prolonged chronicity of the disease and the possibilities arising from this fact make it difficult to give advice to farmers. Where the animal is kept it acts as a reservoir of the organism, and a danger when conditions in the herd become favourable for contagion.

Udder-flora.—As mentioned in my last annual report cows of the Laboratory herd were being exhaustively examined for udder-flora. The results showed that in quarters which had at one time been infected with streptococci occasionally streptococci were found, but staphylococci were more numerous than in quarters which had always been normal. Normal quarters were rarely sterile, usually giving a growth of cocci mainly of a type resembling *Staphylococcus epidermidis* of Bergey's classification.

Cultural Examination of streptococci from cases of mastitis has continued. Such examination has served to demonstrate the unreliability of reactions in sugar media. The differences in morphology and mode of growth, and in the action on blood-agar plates, also rather serve to make the observer doubt the specificity of the streptococcus.

Acidity Tests.—An experiment carried out recently with streptococci from different districts to show whether the acidity produced in the milk in culture might alter the virulence of the disease (a low acid type producing chronic pea-in-the-teat form and a high acid production giving an acute form) resulted in there being very little noticeable difference in the various strains. This must again be attempted, however, with a larger number of cultures.

Animal Experiments.—Guinea-pigs were found to get mastitis if inoculated directly into a quarter, but only for a few days. It would appear that the disease is not blood-borne. Cultures of streptococci inoculated intravenously into the jugular, following injury to the quarter with acid, did not result in the streptococci appearing in the quarter. This fact is important. Experimental vaccination has been carried out prophylactically in four herds this past year, but successful prophylaxis has not been apparent.

The Hamilton Vaccine Co. vaccinated one herd in the Manawatu which had recently been examined for mastitis. Two subsequent herd examinations of milk-samples were undertaken—one after the second dose of vaccine, and one a week after the final dose. A graph made by Mr. Gill shows that there has been a marked increase in acute case since vaccination.

Composite Milk-samples for Tubercle Examination.

From dairies supplying fresh milk to towns 295 samples were submitted to the test, with the satisfactory result that none reacted.

Contagious Abortion.

A large increase in numbers of blood-samples for the application of the agglutination test were received, the increase being due to the experimental vaccinations carried out during the year. A total of 1,953 were received; 480 (24 per cent.) were positive.

It has been found during the year—more so this year than in previous years, owing possibly to the long-continued hot weather—that a very large number of the samples come in laked, especially if more than twenty-four hours elapsed between taking of the sample and its receipt at the Laboratory. This is caused by haemolytic bacilli In other countries whole bloods are not forwarded, but the farmers are instructed to send serum alone. During hot weather this method will, as far as possible, be adopted at Wallaceville. Two bottles will be forwarded, one for whole blood and the other for serum.

The Laboratory clean herd is still unaffected with abortion, and all heifers are now in calf for the second time.

Agglutination Test.—The fast method tried last year was repeated where blood-samples were laked, and again gave good results. Laking of the blood masks the reading of the agglutination test very greatly by the formation of a flocculent deposit. On this account many samples have been thrown out as useless.

Vaccination.—A large number of heifers were vaccinated this present gestation period with a chloroform-killed bacillus. Last year the seventy heifers cited appeared to have given satisfactory results—a decrease in abortion and an increase in antibody, due, it was considered, to vaccination. This resulted in a larger experiment as follows :—

	Vaccinated.	Controls.
Taranaki	393	171
Wairarapa	196	Remainder of herds.
Manawatu	4	3
Mangatainoka	9	..
Hastings	12	..
Total	614	174 plus remainder.

Blood-samples have been examined from all these heifers, and almost all were negative. In one herd where several were already pregnant the bloods gave a positive reaction in a few cases, but the possibility existed that such animals were already in calf. This can be verified later. Fifty samples taken at random at each vaccination showed that there was very little antibody formation in the heifers. Already there have been several abortions. Final figures will not be obtained till calving, but it is already evident that this method of vaccination is not a practical one. Antigen used was made exceptionally strong.

Sterility.

As regards sterility we are very little further advanced. The Laboratory herd was carefully watched. Among the heifers four held to first service and three to second service. Because of calving injuries these heifers were held back longer than usual, making two of them December calvers. The older cows were slightly worse at holding than the heifers, but not as bad as in previous years.

Cervical flora in several of the cases investigated gave almost a pure growth of a hæmolytic streptococcus. This organism passed on to a maiden heifer, and a heifer served once, did not cause excessive inflammation. There was, however, a flushing of the cervix. In the case of one of the Laboratory cows (Bunty) an inflamed cervix gave an almost pure culture of hæmolytic streptococcus similar to others from outside herds.

A second suspicious organism isolated was a thin non-sporulating bacillus growing often in long filaments and occasionally almost in spirochaete formation. This organism has been found on several occasions, and when placed on the vagina and cervix of an experimental cow the original mucus caused a catarrhal vaginitis and some cervicitis. The œstral periods of this cow, however, were not altered. It seems, therefore, as though the filamentous organism might be responsible for acute catarrhal vaginitis. This same organism has been found in semen from bulls of the affected herd.

Specimens from cull-cow drives between March and June gave us no evidence of endometritis being a general lesion.

Tumours.

Fewer tumours were received this year compared with last—131–145. 104 of these consisted of growths known as epithelioma of the orbit, vulva, and brands, the remaining 27 comprising eleven different varieties.

General Specimens.

Cattle.—A total of 142 specimens were received of bovine tissues. Of these, actinomycosis of head and udder gave a total of 13; ragwort-livers, 8; sterility specimens, 54. Three urine samples were received from cows which showed symptoms of eclampsia following calving. They were affected with albuminuria and glycosuria, while kidneys were found acutely affected with parenchymatous nephritis.

Sheep.—Specimens amounted to 258, many of these comprising cases of arthritis, pulpy kidney, and livers of sheep affected with *B. œdematiens*. All diseases under investigation.

Pigs.—Specimens numbered 41; 7 of these were from cases of pasteurellosis.

Other Stock.—Of the remaining specimens, 57 were received from poultry, 12 from horses, 6 from dogs, 2 from goats.

Parasites.

A careful record has again been kept of parasites from domestic animals in order to be able to form an opinion of those present in New Zealand animals. All were classified and a record kept.

Work carried out for other Divisions, etc.

Horticulture.—Forty-six samples of honey for biological test for poisonous properties. None reacted.

Dairy.—This included fairly extended work on "peanut" flavour in butter, but repeated recently with tests on sterile butter containing cultures, no organism has been found to give the flavour noted in the material under examination.

Stores Control Board.—Rideal Walker coefficient of disinfectants. Total, 3.

Blackleg vaccine has been issued where required, a total of 18,800 doses having been requisitioned.

Aggressin.—In March a serious attempt to make aggressin was undertaken with cultures obtained from the Pasteur Institute. Results are not yet completed. The South African technique is being used.

Tuberculin Testing.

A total of 1,967 c.c. of crude bovine tuberculin made at Pasteur Institute was requisitioned from the Laboratory. This was enough to test 6,560 cattle. 100 c.c. avian tuberculin was also obtained, and a number of fowls have been tested intradermally in the wattle. A small supply of tuberculin was also made at the Laboratory, and gave definite reactions in a tubercular cow.

Experimental Work.

Whenever time has allowed, experimental work on one or another phase of various diseases has been attempted, and the following list will place most of that work on record.

Investigations into Mortality amongst Lambs.

Mr. Gill again spent several weeks in the Central Otago district this year, and in addition to continuing the investigations regarding the pathology of the condition, he carried out some controlled experiments to test the efficacy of the various preventive measures commonly advocated. A report of all work done was submitted, and an article embodying the results of the preventive experiments was published in the Department's *Journal*.

Oxalate Poisoning.

A thorough trial of feeding sheep and rabbits with sorrel was made. To compare lesions animals also received potassium oxalate and oxalic acid. This work had a bearing on the Pulpy Kidney question being investigated by Mr. Gill, and the results showed definitely that sorrel was in no way a cause of the pulpy kidney condition in lambs. A report appeared in the *Journal*.

Tæniasis of Dogs.

It is usually recognized that *T. echinococcus* is rather difficult to remove from dogs, and a trial was made on two pups removed from their mother before they had received hard food. Both pups were fed on livers containing cysts of cysticercus tenuicollis and echinococcus polymorphus. A month after the final feed adult tænia segments were found in the fæces of the dogs. One pup was given Kamala in tabloids, and then in powder form, followed by castor-oil, but no beneficial results were obtained. Liquid extract of Filix Mas was then tried, and the dog killed some hours later. A few dead *T. echinococcus* were found. The second pup was given a dose of ¼ grain arecoline hydrobromide in water per mouth. One hour later a very large number of live *T. echinococcus* were voided, together with two other tapeworms—*T. hydatigena*. The following day a further dose of arecoline was given, but no tænia were voided. No tænia were again seen in this dog which was killed a few days later. Post-mortem examination showed the intestines to be quite free from parasites. Experimental work pointed, therefore, to the possibilities of Filix Mas in a dose of 1½ drams in treacle, with a dose of ⅓–¼ gr. arecoline hydrobromide some hours later, being an efficient tæniafuge.

Paraplegia in Pigs.

A commencement was made at the end of the year on feeding pigs with minerals and vitamin B, in the form of yeast, to overcome paraplegia, so common in pigs fed with skim-milk and sharps, &c. Decided improvement followed feeding with the mineral (calcium phosphate) and wood-ash, plus cod-liver oil. Feeding with yeast in skimmed milk and pollard only has made the condition worse. Therefore vitamin was ruled out as a cause. This pig was then

switched over to calcium phosphate and wood-ashes, and within a week decided improvement was noted. Here again vitamin A was found to be of no use in curing the disease, but the cod-liver oil was probably useful in aiding mineral metabolism. Evidence pointed strongly to the condition being a mineral deficiency, and preventive work will be tried on these lines.

Tuberculosis.

B.C.G. vaccine has been used on guinea-pigs, rabbits, and calves, but no thorough trial of immunity conferred has been made to date. One rabbit died of generalized T.B. when inoculated with virulent culture four months following vaccination. One vaccinated heifer given 4 milligrams bovine virulent culture intravenously began wasting, but later improved to some extent. Killed three months later, when only glands surrounding intravenous inoculation on right side, where some leakage had occurred, were affected. This animal would possibly have overcome the disease. No control was inoculated at the time. Further inoculation of animals has been awaiting the growth of suitable bovine cultures. Intradermal tests on vaccinated animals show a marked reaction. Calmette's eye test is in some cases not marked.

Braxy-like Disease in Sheep.

During the year very great progress was made in connection with the above disease in sheep. The causative organism was found and identified as *B. œdematiens*, and a tentative reason given for the appearance of the lesions in the liver. Larval fluke appear to be the agent for transmission of the organism from the intestines to the liver; but it has as yet been impossible to prove this point experimentally, one reason being the difficulty experienced in getting cercariæ, another the extreme difficulty of passing fluke through snails in the Laboratory. An attempt is in progress to overcome these difficulties. A report on this subject appeared in the *Journal*, together with an article on the life-history of fluke, through the native snail *Potamopyrgus antipodum* var. *zelandiæ*. Following this work, important educational instruction has been possible, and farmers in affected localities are commencing to clean up their farms with a view to eradicating fluke.

Lymphadenitis.

Experimental work on a small scale was commenced on this disease. Two sheep, guinea-pigs, and rabbits were fed with cultures for four days, but nothing developed, except in one guinea-pig, where the udder became affected. This possibly arose from the fact that one of the young animals was fed with the culture and infected the udder of the mother. Intravenous injection of the organism into a sheep led to arthritis in a hock and fetlock-joint, and to lesions in the kidney and seat of inoculation, from which the organism was recovered.

Arthritis in Lambs.

In continuation of the arthritis work commenced last year the following experimental work was undertaken:—

(1) Two strains of diptheroids were used—(*a*) *B. pyogenes ovis* from an aborting ewe; (*b*) A Fairton strain of typical arthritis organisms. Each was placed in three pregnant ewes subcutaneously or intravenously. With (*a*) two ewes lambed normally, while a third ewe died with an abscess in the cervical vertebræ due to some leakage from the jugular vein at inoculation. With (*b*) one sheep did well and lambed normally, lamb later sent to butcher fat. A second sheep had dead lamb, posterior presentation. Third sheep with twins, one lamb had been scouring in utero, and later did not develop well. At post-mortem examination nothing abnormal could be found. Second lamb did well and was fattened. This experiment suggested that the enlarged joints were not passed on to the lamb in utero.

(2) Cultural characteristics of the typical strain were worked out. Shortly, it was non-liquifying in serum or gelatine. Branching in gelatine similar to *B. erysipelas suis*. Growth on ordinary solid media difficult. In broth some clouding takes place. Sugars not dependable, but glucose, lactose, and galactose usually fermented. Saccharose and maltose not fermented.

(3) Two ewes douched into vagina with culture just before lambing. Lambs grew well and sent to butcher.

(4) Ewe with twin lambs: Both lambs at four hours after birth given inoculation of broth culture into navel. Lambs did badly, became lame, and developed severe arthritis in all leg-joints except hip-joints. Post-mortem at three and a half months showed extensive arthritis. Cultural methods recovered the original organism, but not in pure culture, other diptheroids having gained entrance.

These experiments suggest that the infection does not come from the ewe, but through the navel from the ground upon which the lambs fall. One other point brought out in this experiment to some extent, and noted in numerous lambs received during the season for arthritis, was the tendency of all diptheroids to attack joints. The temporary lameness seen sometimes before and usually after docking of lambs appeared to come from a diptheroid infection, chiefly of the hip-joint, the diptheroids in these cases being non-specific. Permanent arthritis might follow on from the specific organism, but seemed to be more prevalent on certain farms and not to be ubiquitous in sheep-country.

So-called Rye-grass Staggers in Horses.

Three varieties of rye-grass seed were fed to a horse, but nothing abnormal was noted. The condition has been so prevalent in the field this autumn in sheep, cattle, and horses that experimental work is under way to test out young rye-grass and ergot at certain stages of growth.

Wool.

The good conditions which were experienced during the autumn of 1927 enabled the sheep to enter upon the winter months in good health, with the result that they came through the winter well.

The shearing season was somewhat delayed in parts by wet weather, and to a slight extent the wool was affected, but on the whole it opened up in a good clean and bright condition. At the commencement of the wool-sales it was apparent that competition was going to be keen with a full bench of buyers, and as the sales progressed bidding became more and more animated, with the result that the average price realized for the Dominion clip reached the high figure of 16·89d. per pound, an increase of 4·61d. on the previous year's average.

The following summary is extracted from the annual report of the Wool Instructor, Mr. J. G. Cook:—

The sum of £13,004,199 was received by wool-growers from the wool sold at the Dominion wool-sales extending from 14th November, 1927, to April, 1928 (this latter sale was held at Timaru). During this period 515,351 bales were sold, and averaged £24 5s. per bale, or 16·89d. per pound, showing an increase over the previous year of £6 1s. 11d. per bale and 4¼d. per pound. The highest-priced sale was started on 31st January, 1928, at Dunedin, when 27,218 bales were sold, averaging £27 8s. 5d. per bale, or 19·87d. per pound. A Merino clip was sold at this sale, of which the top-price fleece wool brought 28½d. per pound and the locks 15¼d. per pound, with various prices in between these two lots for the balance of the clip. A satisfactory feature of the wool-sales this past selling season was the tendency of the sheep-farmers to meet the market, and not put high reserve prices on their wool, a fault of previous years. The carry-over this season is one of the smallest yet known, being slightly over 5,000 bales. There

are some of our sheep-farmers who still ship their wool Home to be sold in London, and, as a case in point, 14,638 bales of greasy wool were shipped direct from Gisborne on consignment to the Home market. The following table shows the difference in price per bale between the 1926–27 selling season and the 1927–28 season :—

	1926–27.	1927–28.	Increase.
	£ s. d.	£ s. d.	£ s. d.
Auckland	16 8 10	22 6 3	5 15 5
Napier	17 4 0½	23 9 1	6 5 0½
Wanganui	17 5 0½	23 12 4	6 7 3½
Wellington	18 8 5¾	24 10 5	6 1 11¼
Christchurch	19 15 6½	25 0 7	5 5 0½
Timaru	19 9 0¾	26 1 5	6 12 4½
Dunedin	19 16 4½	26 6 10	6 10 6½
Invercargill	15 19 11½	21 7 0	5 7 0½

The following also shows the total money received by each centre where the wool was sold, from 14th November, 1927, to 31st March, 1928: Auckland, £1,045,586 1s. 3d.; Napier, £2,287,156 10s. 4d.; Wanganui, £1,331,602 2s. 8d.; Wellington, £2,672,255 17s. 11d.; Christchurch, £1,753,668 11s. 3d.; Timaru, £748,493 12s. 6d.; Dunedin, £1,972,016 3s. 10d.; Invercargill, £656,619 5s.

There was a satisfactory increase in the number of sheep in the Dominion last year, the return on 30th April, 1927, showing 25,649,016, an increase of 744,023 over the previous year. The number of breeding-ewes kept eclipsed all previous records, being 14,831,730, an increase over the previous year of 883,478. The dry ewes numbered 831,691, a decrease of 248,044 below the previous year. The number of stud and flock rams increased by 18,739.

Microscopic examination of rams' wool: Farmers take a keen interest in this work, and forward samples of wool for examination. In several cases where a ram has been adversely reported on the owner has followed the advice given and fattened him as a wether. The following breeds show the most faults in their wool: Lincoln, English Leicester, Border Leicester, and Romney Marsh.

Practical demonstrations have been given from time to time on live sheep, showing the points to aim for and the points to avoid; also practical demonstrations in the shearing-sheds on preparing wool for market. A large number of lantern lectures have been delivered with the aid of slides. These show very clearly the great difference between the various fibres grown by some sheep—*i.e.*, pure wool, broken medullation, hairy wool, kemp, and dead fibres. All lectures and demonstrations have been well attended by the farmers.

I still carry out my system of working each district by utilizing the organization of the Farmers' Union to arrange the itinerary so that I can do as many places as possible on one trip. Farmers often transport me from place to place, which assists in keeping down travelling-expenditure. There has been a good demand for Bulletins Nos. 103 and 124.

The Department received twenty-four of the improved all-wool wool-bales manufactured by Mr. F. Aykroyd, of Bradford, England. These bales were tried out, and were not satisfactory, as the report I sent in clearly showed.

For the year to 30th April, 1927, an increase of 564 farmers were shown as owning sheep, the number on that date standing at 25,609.

The following table shows the different countries to which wool was shipped after being sold within the Dominion.

Country to which exported.	Greasy.		Scoured.		Sliped.		Washed.	
	Bales.	Value.	Bales.	Value.	Bales.	Value.	Bales.	Value.
		£		£		£		£
United Kingdom ..	398,920	9,158,744	41,246	1,032,706	68,514	1,460,623	1,278	26,858
Ceylon	2	46	..	..	..	..	..	..
South Africa Union ..	975	14,293	..	..	..	..	..	..
Canada	6,949	153,261	562	11,147	1,564	34,526	..	..
Australia	18,924	460,204	3,615	80,076	3,279	81,825	10	277
Belgium	5,856	127,170	..	..	95	2,680	..	..
Denmark	201	2,820	276	4,823	..	..	..	..
France	82,386	1,892,608	119	2,525	1,263	32,900	..	..
Germany	42,890	988,220	379	18,477	567	10,568	..	..
Italy	7,464	177,099	..	..	..	..	..	..
Netherlands	817	20,397	..	..	..	..	..	..
Sweden	23	500	..	..	..	..	..	..
Japan	15,949	386,883	..	..	15	255	..	..
United States ..	16,845	437,044	149	4,512	2,585	467,321	..	..
Totals ..	598,201	13,819,289	46,346	1,154,266	77,882	1,690,698	1,288	27,135

The grand total of bales is 723,717, and value of wool £16,691,388. The wool purchased by Dominion woollen-mills at sales amounted to 6,275,989 lb., valued at £470,698.

Rabbit Nuisance.

The improvement in the state of the rabbit pest recorded last year has been more than sustained, and the rabbit population to-day is considerably reduced. This refers particularly to areas which were previously known to be badly infested. In some areas in the Auckland District where the season was favourable to an increase rabbits began to show up where previously their presence, although known, had not shown any tendency to increase, and energetic measures had to be taken. To maintain the position now attained constant vigilance will be necessary both by the settlers and the Inspectors, as any slackening will quickly be reflected in increased numbers of the pest and the position be lost.

Strychnine to the amount of 11,718 oz. was sold during the year, being a decrease of 2,090 oz.

To Rabbit Boards a full measure of credit for the improved position is due. The Boards constituted have, almost without exception, justified their existence, and the manner in which they have approached the matter and co-operated with the Department has been an inspiration, and deserves the recognition of the Department and the country as a whole. Increased production would have been an impossible task to have attempted in some districts without an energetic campaign against the rabbit, and the increased sheep now carried is evidence of the success attained. The total amount in subsidies paid out to Boards during the year under the provisions of the Act was £15,300.

The number of rabbit-skins exported for the twelve months ending December, 1927, was 12,928,669, valued at £682,658, as against 20,444,390, valued at £740,975, for the twelve months ending December, 1924.

A consolidation of the Rabbit Nuisance Act, with certain amendments, principally of a machinery nature, and pertaining more especially to the provisions relating to the formation and administration of Rabbit Boards, has been prepared, and its passage through Parliament is urgently desired.

I append hereto the following reports from the officers responsible for the administration of the Rabbit Nuisance Act in the districts of Auckland, Wellington, Canterbury–West Coast, and Otago–Southland respectively :—

Auckland District.

The past season has been most favourable to the increase of the pest. Owing to the absence of heavy rains there were very few casualities in the earlier litters, which quickly matured and entered on the cycle of reproduction. The effect of this became apparent early in the season, when numbers of young rabbits began to show up in districts where previously they have been very scarce. It was readily recognized by our Inspectors and, I am glad to say, by many of the settlers that a special effort was necessary to meet the exceptionally favourable conditions and to hold the pest in check. As the season advanced it became increasingly noticeable that in those districts where the settlers had previously experienced the danger of a rabbit-invasion the increase was less noticeable than in districts where hitherto they had been scarce, and where the majority of settlers nursed the delusion that for various imaginary reasons they would not increase on *their* country. The most glaring example of this was observed in the Northern Peninsula (portions of Whangarei and Hobson County) where the pest has made very definite headway, and where a number of properties were found to be badly infested. An extensive block of unindividualized Native land in Moengawahine Valley—approximately 10,000 acres—was also found to be badly infested. This block has now been closely poisoned by a gang employed by Inspector McKinlay, who reports that the results obtained from the use of phosphorized pollard have been excellent. A very close supervision will be necessary in the districts mentioned to prevent the further spread and permanent establishment of the pest.

A very definite increase also took place in Raglan County, due very largely to the exceptionally favourable season and the fact that supervision had been temporarily relaxed owing to the transfer of the Assistant Inspector. In Waikato, King-country, and Rotorua districts, where the settlers were more alive to the danger, the increase has been less noticeable, and, generally speaking, a determined effort is being made to reduce the pest to the lowest possible minimum during the winter months. The Rabbit Boards operating in this district continue to do excellent work.

The extensive areas of Crown and Native lands worked by our Department are in good order, there being practically no increase in the number of rabbits, notwithstanding the favourable season. Three blocks of Crown land, approximately 65,000 acres, situated in the East Coast Rabbit Board's district and previously worked by that Board, is now being poisoned by our gang. These blocks, which are badly infested, it is considered can be worked by our men more economically than by the Board's rabbiters. Owing to the continuance of very hot weather the general poisoning commenced a month later than usual. A heavy demand set in for supplies of phosphorized pollard during February and March.

Sales from the Frankton poison-depot for the year ending 31st March, 1928, show a slight decrease in phosphorized pollard and carbon bisulphide, and a decided decrease in strychnine, as represented by the following comparative table :—

	lbs.
Pollard poison on hand, 1st April, 1927	21,621
Manufactured to 31st March, 1928	45,141
Total	66,762
Despatched from depot to 31st March, 1928	55,496
Manufactured pollard poison on hand, 1st April, 1928..	11,266
Total	66,762

Sales—	1927.	1928.
Pollard poison	49,423 lb.	55,496 lb.
Strychnine	1,988 ,,	1.319 oz.
Carbon bisulphide	379 gal.	958 gal.

The decrease in sales of strychnine is probably due to the fact that the prolonged summer weather has retarded development of winter fur, and the fur-hunters have consequently delayed operations to a later date than in previous years.

Wellington District.

Since my last report another decided decrease in the numbers of the pest has taken place, and I am pleased to be able to report that, with a very few isolated exceptions, owners are energetically pursuing the work of rabbit-destruction with a view to so reducing their numbers that the natural enemy will gain the balance of power and keep the pest well in check without human aid.

Rabbit Boards in this district still continue to justify their existence, all having done excellent work, and in most cases now have the pest reduced to an easily controlled minimum. It is pleasing to note that settlers throughout the areas of the several Boards where the rabbiting-work is done by land-occupiers under the superintendence of the Board's Inspectors are carrying out the necessary control and eradication work with a minimum of friction between the Board's officers and themselves. A number of the Boards do not employ an inspection staff, but carry out the rabbiting-work with the Board's men under the charge of a foreman rabbiter, and in these cases there is no friction with the settlers as each settler acts as an inspector in respect to his own property, and possibly of other holdings as well, and reports to the Board the presence of rabbits, with a request that they be dealt with, and all such reports are immediately attended to by the Board's staff.

In those areas in which the Rabbit Act is directly administered by this Department's Inspectors rabbits are very well in hand also. Odd rabbits have been located in places in Taranaki, and energetic steps were immediately taken to have them eradicated.

Canterbury–West Coast District.

I have very much pleasure in reporting that the pest continues to show a very satisfactory improvement throughout the whole of my district, all Inspectors reporting a marked decrease as compared with last year. Weather conditions during the winter were very favourable for poisoning operations, with the exception of about three weeks in May last, when a large area of the high country was under snow, accompanied by very severe frosts, the rabbit-supression work being consequently delayed for the period in that part of the district. However, the remaining portion of the winter and spring was exceptionally mild, enabling the settlers to poison the country very thoroughly. They also in many cases were able to go over the work a scond time. Good work was also done during the summer and autumn months, with excellent results. Strychnine, and

carrots and strychnine, and oats have been the principal methods adopted for poisoning during the winter, and these were in some instances followed up with a phosphorized-pollard poisoning in the spring. A large number of settlers are also using calcium cyanide or carbon bisulphide for fumigation purposes, especially the former, as it is considered more convenient to handle, and where the work is carried out properly the results are highly satisfactory. A few trappers are still working on areas adjacent to the railway, where the carcasses can conveniently be sent to the city for retail shops, and, as they work through the summer, they are doing good work. The natural enemies are increasing and undoubtedly are of great assistance in keeping the pest in check, more especially in destroying the young rabbits. During the year approximately 14,130 lb. of phosphorized pollard was sold from the Department's depots. The Department, in this district, also sold 2,498 oz. of strychnine and 1,063 lb. of carbon bisulphide.

Otago–Southland District.

A further decrease in the state of the rabbit pest all round is apparent—substantially so in many parts. This is also borne out by every Inspector throughout Otago and Southland. There are, however, a few dilatory landowners here and there who do nothing in summer-time, except when forced to by continuous warnings from Inspectors, and at times not until drastic action is taken.

The cold, wet spring and early summer months of 1927 no doubt assisted in the destruction of rabbits to no small degree, as thousands of young nesters were drowned. Up to the end of December rabbits were so few that many landowners were of opinion that the days of the pest were gone. Nevertheless, from the end of December, when weather conditions became ideal, an increase was very soon noticeable, but nothing like what we have seen in the past.

The commercialization of rabbit carcasses and skins is still very much in existence, and although this relieves the landowner from paying out for their destruction at certain times of the year, it has, on the other hand, a great tendency to conserve rabbits for high prices in winter. Therefore the class of summer work carried on in many places is only of a makeshift nature, and this is where landowners fail to rise to the occasion in not paying for the work done, and in not providing for supervision.

The adjournment of rabbit prosecutions in North Otago in particular is not in the interests of the Department's efforts in controlling the rabbit pest; and I feel sure that some landowners take advantage of this, as the time allowed by the Court brings them within the period of good payable skin-prices.

One inspectorate (Ophir) has been cut out during the year, and the adjoining district boundaries (Clyde and Ranfurly) have been adjusted accordingly. The Waihola District headquarters was transferred to Milton, and an alteration in this and the Dunedin district boundaries has also been made.

Strychnine poisoning is now almost universal; carrots, oats, and apples being used in winter, and strychnined pollard for summer in some districts. The use of phosphorized pollard again shows a decided decrease during the year, which you will note from summary given below. Fumigation of burrows in all low and suitable country continues to give excellent results where well carried out. The use of traps is gradually becoming less prevalent, but they are still too much in evidence. The natural enemy is reported as being on the increase, and is doing great work outside the trapping-area.

Rabbit Boards are four in number. The country under their jurisdiction is gradually improving also.

Summary of Rabbit Poison and Material sold to the Public, used on Crown Lands, Native Lands, and Railway-lines for 1926–27 and 1927–28.

Article.	Sold.		Crown Lands.		Railway-lines.		Native Lands.	
	1926–27.	1927–28.	1926–27.	1927–28.	1926–27.	1927–28.	1926–27.	1927–28.
Phosphorized pollard (pounds)	52,937	21,129	2,390	2,009	3,107	2,054	144	60
Phosphorized oats (pounds) ..	2,861	2,435	200	92	141	11	31	..
Bisulphide (pounds)	26	106	497	309	812	943	8	49
Phosphorus (pounds)	69	117	..	..	..	..	..	..
Strychnine (ounces)	6,510	6,297	36	4	..	..	2	..
Cartridges (number)	..	..	740	130	..	..	..	..
Calcium cyanide (pounds) ..	..	..	..	12½	..	7½	..	..

Noxious Weeds.

The control and eradication of noxious weeds is a problem which faces the Department and settlers in practically all farming districts throughout the Dominion. Some weeds are spread over large areas, and the prevention of their further spread calls for ever-increasing vigilance.

During the year representations have been made on the one hand urging the Department to administer the Noxious Weeds Act more strictly, while on the other hand complaints are made by the occupiers of infested land that the requirements of the Department are excessive and unreasonable. Officers are thus frequently involved in situations of a most difficult nature. To strictly enforce the Act in certain cases many settlers would be forced to leave their holdings; nevertheless sheer neglect would mean a serious menace to neighbouring occupiers. Cases of this nature are by no means few, and are a constant anxiety to the Inspector as well as to the occupiers.

A matter of frequent comment is the so-called neglect of the Government to clear weed-infested Crown and Native lands. In reply to this criticism, it can be affirmed that a certain amount of clearing of these lands is done every year, and the money available is spent where permanent results are likely to be obtained—for example, on lands only slightly affected, or on lands where the weeds are liable to spread to clean and occupied adjacent country. It would be futile to attempt to clear great areas of weed-infested Crown lands which are inaccessible and likely to remain unoccupied and unproductive for an indefinite period. Expenditure on this class of country would be a waste of public money.

Probably the weed which, on the whole, gives most trouble is blackberry, and investigations are still proceeding in order to discover an effective and practicable way of eradicating this weed. The use of the common goat for clearing land infested with blackberry is a distinct success, and an article

explaining the method appeared in the *Journal*. In this connection the District Superintendent, Wellington, remarks as follows :—

In the control of weeds, chiefly blackberry, goats have in some districts been a great assistance, and are being brought more into use for this purpose each year. In Nelson, Marlborough, and Taranaki these animals have been extensively used for weed-control for several years, and within the past four years several thousand goats have been imported into the Wairoa County from other districts by settlers who have faith in them as blackberry-destroyers. In Wairoa they are reported to have done, and are still doing, excellent work on this weed. In Nelson, Marlborough, and Taranaki landowners have demonstrated that infested areas can be cleared of blackberry and other weeds by means of goats, provided they are properly controlled and folded on the infested areas.

Ragwort appears to have been less troublesome than in some previous years. A considerable number of settlers are now stocking up with sheep, and this is proving the most satisfactory method of checking the spread of ragwort.

During the last session of Parliament the Noxious Weeds Amendment Act, 1927, was placed on the statute-book. This Act, *inter alia*, relieves the Department of the control of weeds in urban areas, and places on the local authorities of such areas the responsibility of administering the Act in the districts under their jurisdiction. Another amendment, and an important one, is the new definition of the word "clear," an adjustment which will strengthen the hands of those administering the Act.

Shearers' Accommodation.

The work connected with the inspection of shearers' accommodation, under the Shearers' Accommodation Act, has continued to be carried out by the officers of this Division, and needed improvements to the accommodation provided for shearers are gradually being accomplished with little friction, and only in a few instances has it been necessary to take legal proceedings in order to enforce the requirements of the Inspector. It can quite honestly be said that, on the whole, the accommodation provided is now fairly good, and while some owners are under requisition to effect additions or alterations, and in some cases provide new premises, they show a desire to meet the reasonable demands of the Inspectors immediately.

Further particulars in regard to the work carried out under the Act are being supplied to the Labour Department, on whose behalf the work is being performed by this Department.

Staff.

To the staff as a whole I wish to again record my appreciation for the loyal service which they have rendered during the year. The difficulties of the year have not been light, but these have been faced, and, if not wholly overcome, progress has been made.

The desire of the Division is that the service rendered the farmer should be of the utmost value to him in the tasks before him, particularly in the direction of assisting him to overcome his own peculiar difficulties. It is desired to strengthen and extend this work, and to endeavour to give increased service in the Animal Husbandry Branch of farming, in order that many weaknesses which are only too evident, and a hindrance to increased production, may be removed.

A rearrangement of some stock inspectorates through amalgamation has been made possible by the reduction in the rabbit pest; but if the position of the rabbit pest to-day is to be maintained, and noxious-weeds control is not to be weakened, there is a limit to which this curtailment of inspectorates is to be extended, as the districts are already large, and the necessary close supervision might easily be rendered impossible and the position of to-day, gained after many years of endeavour, be lost.

DAIRY DIVISION.

REPORT OF W. M. SINGLETON, DIRECTOR.

The Season.

Although an exceptionally dry summer was experienced, approaching almost drought conditions in some districts, the year as a whole has been fairly favourable to the production of dairy-produce. A mild winter followed by good spring conditions in most districts enabled dairy cows to commence the new season in good condition.

Production of milk fell off considerably during the drier months, but, as good rains were experienced fairly generally in the early autumn, feed has since been in abundance. As a consequence of the dry summer, hay and root crops have not been so good as in the previous season, but, provided the coming winter conditions are favourable, dairy cows in many districts should commence their next lactation period in good heart.

Production.

The production of butterfat during the year under review, it is pleasing to record, has never previously been exceeded over a similar period, and exceeds the previous peak year of 1924–25 by some 5,212 tons.

The more general use of fertilizers as a top-dressing agent, thus giving pastures an increased resistance to drought conditions, and an improvement in the producing-capacity of dairy herds, have been contributing factors towards this high record of production.

Quality of Butter.

The general consensus of opinion among the Dairy-produce Graders and Dairy Instructors is that the quality of our creamery butter has been maintained, and that a number of dairy companies have effected some improvement.

Owing to the rank growth of pastures during the earlier spring months, and later on to the effect of the dry summer, supplies of raw material to the factories were detrimentally affected, but despite these drawbacks butter of a very uniform quality has been manufactured. The exercise of extreme care in correcting acidity in cream is now general, and soda flavours are rarely met with.

Whey Butter.

The production of this class of butter shows an increase over last year's figures. There is still room for much improvement in quality. Owing to the pressure of work, the Butter Instructors are unable to devote more time in this direction, but a closer co-operation between the operator in the cheese-factory and the buttermaker would be instrumental in the production of a higher-quality article.

Quality of Cheese.

The high temperatures prevailing during the summer months made the manufacture of cheese of a high quality a very difficult task, and, taking the season as a whole, it has been a most trying one for the cheesemaker. Quality of cheese has in consequence shown some falling-off in most districts as compared with the previous year. While there has been an appreciable reduction in the quantity of "second grade" cheese manufactured, there has also been a decrease in the quantity of "finest." Lack of uniformity has been prominent amongst the defects, and many cheese were of open texture and weak in body. Coloured cheese were in some cases bleached in colour.

Finish of cheese continues to show improvement, and a large number of factories are now making a "rimless" cheese, while others are turning out a cheese with a minimum rim.

The pasteurization of milk for cheesemaking is now almost general, the output of this class of cheese being approximately 92 per cent., as against 86 per cent. for the previous year.

A number of factories have installed plant for the paraffin-waxing of cheese, more especially in the Auckland Province, where approximately 50 per cent. of the output was wax-coated.

Storage of Cheese and Butter.

The arrangements for the storage and handling of butter and cheese intended for export are now on a very satisfactory basis. All cheese is pre-cooled prior to export, and temperatures in the butter-rooms are generally satisfactory. During shipping-out and loading operations the graders and also the shipping companies pay special attention to temperatures, and the duties of the shipping supervisor attached to the Dairy-produce Board include the supervision of suitable storage conditions for dairy-produce on overseas vessels. Shipments during the year have been frequent and regular, and no congestion has occurred at any of the grading-ports.

Quantities of Butter and Cheese forwarded to Grade Stores for Years ending 31st March, 1928 and 1927.

Port.	1928.		1927.	
	Butter.	Cheese.	Butter.	Cheese.
	Cwt.	Cwt.	Cwt.	Cwt.
Auckland	956,523	229,173	870,946	237,787
Gisborne	22,298	..	15,570	..
Napier	32,497	4,686	18,216	2,453
New Plymouth	119,519	301,281	116,108	306,035
Patea	35,318	344,306	27,718	348,818
Wanganui	65,719	106,424	70,068	84,647
Wellington	186,001	229,658	150,870	241,028
Lyttelton	37,982	26,313	40,483	27,479
Timaru	7,336	14,174	10,735	14,173
Dunedin	29,528	41,061	34,344	36,991
Bluff	11,743	209,222	12,799	215,764
Totals	1,504,464	1,506,298	1,367,857	1,515,175

"Finest" Grade.

The use of "finest" grade, which includes all creamery butter and factory cheese scoring 93 points and over, has been in operation throughout the year. Despite the difficulties experienced by butter and cheese makers in consistently manufacturing a highest-quality article, chiefly through the extremely dry weather conditions which prevailed, 68·33 per cent. of the butter and 34·15 per cent. of the cheese graded was classed in this highest grade. Evidence appears to be accumulating to the effect that "finest" quality is worthy of a premium in price over "first" grade. More than one firm of buyers has requested that the crate numbers be indicated as for the different grades in lines containing more than one grade.

Value of Exports.

Prices of dairy-produce for the year have, on the whole, been satisfactory, as is indicated by the Customs statistics of the value of exports. Including butter, cheese, dried milk, casein, condensed milk, and milk-sugar, values reached a total of £18,590,866, as compared with £15,232,471 for the previous year, an increase of £3,358,395.

Casein.

The quantity of casein manufactured during the year was in excess of the preceding year by 469 tons, and consisted mainly of lactic casein. Quality continues to be uniform and of a high standard. 1,771 tons lactic and 462 tons rennet, making a total of 2,233 tons, were manufactured for shipment, as compared with 1,613 tons lactic and 151 tons rennet casein for the previous year.

Testing Butter for Water Content.

During the year, as in the past, every churning of butter intended for shipment has been tested for moisture, with satisfactory results, a very even standard being maintained. 137,265 churnings were tested, the average water content being 15·19 per cent., as against 15·15 per cent. for the previous year. A number of churnings over the legal limit of 16 per cent. were received, representing a percentage of 0·73 of the total, and the usual practice of returning these to the dairy companies to be reworked with drier butter was carried out.

Branding Dairy-produce with National Brand.

The use of the national brand on containers of "finest" and "first" grade butter and cheese has become the practice of each dairy company. Old stocks of containers not bearing this brand have become exhausted, and uniformity in the style of the various brands has now become well established. The general adoption of such an attractive brand, together with the advertising of that brand, should be of assistance in the more successful marketing of our dairy-produce.

The impressing of the national brand into the butter on the top of the 56 lb. block has been suggested, and will doubtless be given effect as from the beginning of next season. This should add to the attractiveness of the finish of the butter, and make its appearance more pleasing to the importers, wholesalers, retailers, and consumers of New Zealand butter.

Cream-grading.

The compulsory grading of cream, and the payment of a differential price for "finest," "first," and "second" grade cream, has been in operation during the whole year, and the beneficial effect of this is reflected in the high quality of our creamery butter.

It is pleasing to record that the great majority of dairy companies have been whole-hearted in their endeavour to grade in accordance with the standards fixed by the Division. Some irregularities, inseparable from the introduction of any new method, have come under notice, but these have been corrected, and with few exceptions the system is now working on comparatively good lines.

Farm Dairy Instruction.

Although this sytem of instruction to the suppliers to dairy companies has now been in operation for a number of years, it has not during the year shown the advance that its importance warrants. There are now thirty-one Farm Dairy Instructors employed by dairy companies, as against thirty-three for the preceding year. One new appointment was made in the South Island, and three officers were dispensed with in the North.

The combination of cream-grading and farm dairy instruction on a national basis would be of inestimable value in the improvement of milk and cream supplies, and it is urged that dairy companies give this matter their serious consideration during the coming winter.

Inspection of New Zealand Dairy-produce in Great Britain.

The number of inspections of dairy-produce becomes greater each year, and the work is carried out systematically and expeditiously by Messrs. Walter Wright and A. C. Ross. Numerous detailed reports on the quality of dairy companies' produce come to hand by each mail, and these are in turn forwarded to the dairy companies concerned. Many other matters coming within the scope of these two officers' work and of interest to the industry are also fully reported on.

Preservatives in Butter.

The prohibition of the use of preservatives in butter consumed in the United Kingdom came into force on the 1st January, 1928. Dairy companies were notified by the Division of the Ministry of Health's requirements in ample time to enable adjustments to be made where necessary, and it is pleasing to note that no complaints have been received from Home in reference to non-compliance with this regulation.

Tests of the various butters exported have been made at intervals for preservatives, and these have shown that New Zealand dairy companies, without exception, have honoured the regulation of the United Kingdom. So much so was this expected by the Division that no attempt was made to get a regulation gazetted making the export of preservatized butter illegal.

Experimental Dairy Factory.

It has been decided that the experimental dairy factory formerly proposed to be erected at Wallaceville will now be erected at Palmerston North and on the grounds of the Massey Agricultural College. This building will be used for various purposes, and should prove a useful adjunct to the industry.

The plans and lists of plant prepared for the building at Wallaceville have been used as the basis for planning the new building at Palmerston North and providing it with plant. Extensions have been made to provide for the demands of the college. It is expected that the new building and plant will be ready for use next spring.

Check Testing Milk and Cream Samples at Dairy Factories for Butterfat.

The issue of the Dairy Produce General Regulations enabled the Division to give this matter better consideration. Dairy companies are now giving the Division an indication of their figures representing the yield of cheese or butter as per pound of butterfat for the season. Some of these are regarded as being rather high and as from 1st January, Mr. G. R. B. Boswell, has been on duty as check testing officer. In connection with this work he is directly responsible to and takes his instructions from the Director of the Dairy Division. It has been deemed advisable to keep this service segregated from the butter and cheese instruction work so as not to interfere with the good feeling existing between factory-managers and Dairy Instructors. Mr. Boswell's work has evidenced need for such checking. There has been too much carelessness in connection with the carrying out of this work at a number of dairy factories. Many irregularities have been noted and, we believe, corrected. Up to the present this work has actually been more of the nature of instruction than inspection.

Certificate-of-Record Testing.

Although there remains a steady demand for the services of the Division's testing officers in connection with the certificate-of-record testing of purebred dairy cows, the support accorded this work last season did not reach the figure of the previous year. For the calendar year 1927 some 529 certificates were issued, as compared with 576 for the previous year. For the peak month of the present season 214 breeders were participating in this work, their entries totalling 622 cows.

Official Herd-testing.

At the commencement of the present season the official herd-testing of purebred dairy cows was introduced. This scheme is open to all C.O.R. breeders, and permits the testing of all purebreds in the herd other than those on C.O.R. test. In isolated instances, where no other opportunity of testing is available, the Division has extended acceptances to cows other than purebreds. The method is similar to the C.O.R., except that the owner takes no milk-weights, the yield being based on milk-weights and samples taken by the testing officer at the time of his usual C.O.R. visit. The fee for this service is 5s. per cow per season. The support accorded the scheme for this, the first season, has been very gratifying, some 109 of our C.O.R. breeders participating to the extent of over 1,500 cows in the flush of the season.

Herd-testing Associations.

During 1926–27 some 170,150 cows were tested in New Zealand, these figures representing testing under the group system, where milk weights and samples are taken by an independent officer, and under the association system, where milk weights and samples are taken by the herdowner or his agent. This number of 170,150 represents 13 per cent. of the total of our dairy cows in milk and dry, and is comprised of 109,827 cows tested under the group system and 60,323 under the association method. Herd-testing for the season under review has received a certain impetus by the Government subsidy of £8,000 toward the cost of carrying out this work, and although definite figures are not yet available it is anticipated that the number of cows being systematically tested in the Dominion this season is little short of 200,000.

Staff.

The volume of dairy-produce now being manufactured has entailed increasing work on all members of the staff, and their loyal and efficient co-operation is thankfully acknowledged.

The Division desires to record its deep regret at the death of Mr. W. R. Harkness, Dairy Instructor, who passed away after a short illness in January last, and extends its sympathy to Mrs. Harkness and family in their sad loss.

Regret is also expressed of the retirement through ill health of our colleague, Mr. A. A. Thornton. Mr. Thornton was the first Grader appointed by the Department, and his service to the dairy industry leaves an ineffaceable impress on the grading-work of the Division.

Mr. G. M. Valentine, Dairy Instructor, has been appointed Superintendent of the dairy factory attached to the Massey Agricultural College, and will take over his new duties during May. He will continue to be an officer of the Division.

A further appointment is that of Mr. G. R. B. Boswell, Special Inspector, whose principal duties are the checking of butterfat tests at factories of milk and cream, and the checking of cream-grading.

Appreciation.

Thanks are extended to the Department's Chemist and Bacteriologist for their valuable help, and also the Forest Products Branch of the State Forest Service for assistance rendered during the year. The various cattle-breeding associations, and also the freezing companies controlling the cool stores where dairy-produce is held waiting shipment, have willingly assisted the Division during the year, and this is gratefully acknowledged.

HORTICULTURE DIVISION.

REPORT OF J. A. CAMPBELL, DIRECTOR.

The Fruitgrowing Industry.

From a horticultural point of view the year just closed has been a very satisfactory one. In many districts the climatic conditions were somewhat unusual, excessive wet weather being experienced during the autumn and winter months, followed by a dry warm spell during the spring and summer, which was favourable to the development of the crops. As a result, heavy crops of pip-fruits, especially apples, were harvested, while the return of stone-fruits was above the average. Owing to the continued dry weather, some varieties were lacking in colour, more particularly Jonathans and Delicious. In the Marlborough and Motueka districts a hailstorm caused serious damage to the apple crop, and considerably reduced the quantity available for export.

The crops of small fruits, such as strawberries, raspberries, and gooseberries, were fair average ones, the same applying to outdoor-grown tomatoes, with one or two exceptions.

Citrus-culture is receiving increased attention, satisfactory crops of lemons being obtained from the orchards already in bearing. An up-to-date lemon curing and packing shed has been established at Tauranga by the local Citrus-growers' Association.

There was no serious outbreak of orchard diseases during the year, and the majority of ordinary diseases and pests were kept under control where proper precautions were taken to combat them. There is still, however, room for improvement in this connection, more especially in the case of small orchards.

Investigations are being carried out as to the cause of "cracking" in apples, more especially in the Dunn's variety, which trouble has been prevalent in the Nelson central district during the last few seasons, and it is anticipated a solution of the trouble will be arrived at before long.

Owing to the further spread of fireblight disease, the whole of the North Island has been gazetted a fireblight area. Every precaution is being taken to confine the disease to the affected areas by the cutting-out of hold-over cankers, and the destruction of hawthorn hedges in those districts coming within the Third Schedule of the Fireblight Regulations.

In some localities red mite and bronze beetle have been troublesome, also leaf-hopper, mealy bug, and leaf-roller caterpillar. Black-spot and brown-rot diseases have not been so prevalent as in former seasons. The breeding of the natural enemy of the pear-midge is still receiving attention in the Biological Laboratory. Effective work is still being done by the *Aphelinus mali*, the natural enemy of the woolly aphis, this pest having been entirely eradicated in some localities by the operations of the *Aphelinus*. Experimental work is still being carried out for the control of earwigs, which are causing considerable damage to both fruit and vegetables, especially in the southern districts. The use of baits and hedgehogs is being tried, but it is doubtful if anything less than a natural enemy of this pest will give anything like satisfactory results.

Some 216 acres were planted in commercial orchards during the last planting season. The total area under commercial orchards for the whole of the Dominion now stands at approximately 30,000 acres. A number of old and neglected orchards were cut out during the year.

The use of stationary spraying outfits in lieu of portable power-pumps is now becoming generally recognized, and the former are a feature in a large number of commercial orchards in different districts throughout the Dominion. These stationary plants are especially applicable to hilly country, where the task of hauling heavy tanks of liquid spray, especially after wet weather, is exceedingly arduous.

The demand for information and advice on the many phases connected with horticulture generally has been very considerable, and every endeavour has been made to supply as full particulars as possible in connection with the varied requests.

Export of Fruit.

During the 1927 export season a total of 544,233 cases of fruit were exported overseas. Of this total, 448,401 cases of apples and 22,075 cases of pears were shipped to Great Britain, 67,448 cases apples to South America, 5,360 cases apples to Honolulu, and 799 cases apples to Canada. The prices realized were very satisfactory, and there was very little call on the Government guarantee.

The guarantee has been renewed to cover shipments of both apples and pears made during the 1928 season, the grower being guaranteed a gross market price of 11s. per case for fruit of "extra fancy" and "fancy" grades, and 7s. per case for "good" grade. In regard to South American markets, the gross price is considered to be the c.i.f. price, plus 1s. 6d. per case selling-charges.

Owing to the prolific crops, it is expected that the number of cases exported during the 1928 season will be over the million mark, which will be an outstanding event in the history of fruit-export from the Dominion.

The Canadian fruit-export case, which has been adopted as the standard export case, is giving universal satisfaction, and the packing, generally speaking, is being carried out in a satisfactory manner.

During the year Mr. H. E. Stephens was appointed representative of the New Zealand Fruit-export Control Board in England, *vice* Colonel Gray, who has returned to New Zealand. Mr. Stephens is ably carrying out the work connected with the distribution, &c., of New Zealand fruit on the Home markets.

Local Markets.

The inspection of New-Zealand-grown fruit on the local markets was carried out during the year. There was again a tendency to flood the main markets with low-grade fruit, thereby affecting the prices received for fruit of high-grade quality. Both fruit and vegetables have been in good supply, and the bulk clean and free from disease. Satisfactory prices were received by the grower for good-quality stuff.

The tendency to "topping" is still in evidence, this practice applying more to growers of vegetables, who deceive the purchaser by placing good specimens of the particular class of vegetable at top of package, the bulk below consisting mainly of inferior rubbish. It was found necessary to take proceedings in a number of instances for breaches of the regulations governing this matter.

Instructional and Experimental Work.

Full advantage is taken by growers and others of the opportunities existing of obtaining advice and practical instruction in all phases connected with fruitgrowing, &c., and the officers attached to the Division are ever ready to impart such information in the course of their official duties. In this connection lectures and demonstrations are given by the Instructors in the various districts, and advantage is also taken of delivering radio broadcast addresses on suitable subjects.

A good deal of the improvement that has taken place in the grading and packing of fruit is due to the classes on these subjects, which are conducted by the Orchard Instructors in the main commercial centres during the winter months in co-operation with the fruitgrowers' associations. The opportunity of obtaining the departmental certificate of competency in apple grading and packing is fully appreciated by those attending the classes. The same applies to the examinations held for the certificate in orchard pruning and spraying.

The carrying-out of tests with various fruit-tree stocks, a matter which is of vital concern to commercial fruitgrowers, is at present receiving attention. The important apricot and cherry crops of Central Otago are growing on sundry and unknown stocks, many of them being unsatisfactory. With a view to obtaining more definite knowledge and ascertaining the best stocks for these trees under the special local conditions, all reputable stocks are being tested for purposes of comparison. The lemon and orange groves of the Auckland Province are in a somewhat similar position, stocks suitable in other countries being not always suitable for New Zealand conditions.

A request was received from Italian settlers in Nelson for assistance in introducing suitable species of mulberry for the raising of silkworms. As these people are accustomed to the work, and it being a profitable domestic side-line to fruit and tobacco raising, the request was acceded to, as it is possible other settlers also may find it a useful occupation in a suitable climate.

Serious losses to the important stone-fruit crop of Central Otago are experienced periodically by growers through late-spring frosts. At the request of the local Fruitgrowers' Association, the Department imported special oil-burners and other apparatus, and demonstrated methods of frost-fighting during the past season. Valuable technical assistance was rendered by Dr. Kidson, Government Meteorologist. The growers concerned now have a good knowledge of the methods, costs, and possibilities of frost-prevention under local conditions.

Experiments were also conducted for the control of the more troublesome diseases affecting fruit-trees. Of special note is that for the control of brown-rot-fungus disease in stone-fruit in the Auckland District, where the average orchard has lost from 40 per cent. to 60 per cent. of fruit through attacks of this disease. As a result of this experiment less than 1 per cent. loss was experienced. The tests for the control of the so-called "mystery" disease of strawberries in the same district have so far given no definite results, and are being continued.

Experiments are being carried out in the Otago and Auckland Districts to ascertain essentials required to increase production and eliminate poor-quality fruit. By these means it is hoped to increase the production per acre, lower production-costs, and have more first-grade fruit available for local and overseas markets.

Several new proprietary spraying-compounds were submitted for official testing, and are receiving attention.

Fruit Cool Storage.

Further successful work has been carried out in the fruit cool stores for the control of flesh collapse and for the elimination of waste. In association with the Department of Scientific and Industrial Research and the Low-temperature Research Station of Cambridge, England, investigations are being made in the carriage of fruit overseas.

Viticulture and Wine-making.

The area planted in vineyards is steadily increasing, there being now some 320 acres under vines throughout the Dominion. Although the past season was not altogether favourable to grape-production, the results obtained were better than those of the previous year, when the crop was a very light one. Owing to different weather conditions, the grape crop varied in some districts. In the Auckland District an unusually dry period during the growing season considerably reduced the crop of the Albany Surprise variety, but other varieties profited by the absence of fungoid disease, with the result that the crop was a very sound one, and the wine produced should prove of excellent quality when matured. Different conditions prevailed in the Hawke's Bay District, where prolonged wet weather during the ripening period caused considerable loss. The quantity of wine produced from the year's vintage is estimated at 76,000 gallons, which at a conservative estimate is valued at £30,400.

Owing to the increased interest in viticulture there has been a considerable demand for grafted vines and cuttings. With a view of increasing the number of useful varieties of grapes, the Department introduced some sixty new varieties for testing out under New Zealand conditions, and a further consignment is expected to arrive shortly.

The majority of diseases and pests have been readily kept under control. Downy mildew made its appearance in a few places, but any losses sustained from its attacks have been very small.

Growers of grapes under glass have experienced a good season, and prices realized have been satisfactory. A number of new glasshouses were erected during the year.

Cider-making.

In the main apple-growing districts the making of cider is still receiving considerable attention, and a large quantity of otherwise unsaleable fruit is being profitably utilized. The quantity of cider manufactured during the year is estimated at 50,000 gallons, valued at approximately £12,500.

Te Kauwhata Horticultural Station.

This station is making good headway, and, in addition to being a valuable asset for experimentation in grape-growing and wine-making, it continues to be a commercial asset. The gall fungus continues to do considerable damage in the wattle plantation. The pastures, owing to severe cold in spring and a very dry summer, have not done as well as usual. Twenty acres of new pasture were sown in February, but little progress was made. Twenty acres of wattle plantation were brought into cultivation to supply winter feed for sheep. A further area was cleared, and will be finally cleaned up and ploughed this winter.

Sheep: Wet and cold weather at lambing-time caused heavy mortality, the total losses from all causes being twenty-nine ewes. Otherwise the percentage of lambs was very fair. The total receipts from this branch of the farm were £980—an increase of £455 over last year.

Wattle: The selling of wattle-bark to the tanneries continues to be the main operation in the plantation. Use is also being made of the waste timber by selling it as firewood, but to get a sale it has to be sawn into convenient lengths. Timber-cutting on a royalty basis was continued. Two hundred tons of green bark were harvested. The total receipts from the plantation amounted to £1,620, as against £928 last year.

Grapes and wine: An extension was made to the vineyard by the planting of a number of European varieties new to New Zealand. The extension to the cellar accommodation is thoroughly complete, and the three new vats give extra holding-capacity of 4,500 gallons. The benefit of this extra maturing-space was much appreciated during last vintage, and should result in a more even standard of wine. The stationary spraying outfit installed during the spring has proved very satisfactory. The 11,394 gallons of wine sold realized £5,541.

The financial aspect of the station is still healthy, receipts exceeding expenditure by £1,868.

Orchard-registration and Orchard-tax.

Under regulations gazetted on the 19th January, 1928, all orchards from which fruit is sold or planted for the purpose of eventually selling fruit therefrom require to be registered during the month of January in each year, instead of in the month of September as required previously. The Orchard-tax Act was renewed during last session, with certain amendments. The Act now provides that tax shall be payable at the rate of 1s. per acre, with a minimum tax of 5s., and requires to be paid by the 22nd March in each year. Orchards consisting of less than 120 fruit-trees are exempt from tax.

The total number of taxable orchards registered to date is 3,021, and 2,663 non-taxable, making a total of 5,684. The amount payable in tax is £1,269.

Registration and Inspection of Nurseries.

The bulk of the nurseries inspected are clean and free from disease, and no difficulty is being experienced in having the regulations complied with. Six hundred and ninety-five nurseries were registered during the year, and £695 collected in fees. This represents an increase of fifty-eight registrations as compared with the previous year's figures.

New Zealand Institute of Horticulture.

The New Zealand Institute of Horticulture has carried out a great deal of preparatory work in relation to the objects for which it was formed. The educational programme of the Institute has come under special recognition, and in order to place the Institute on a sound footing the New Zealand Institute of Horticulture Act was passed last session. Under this Act the Institute will have full legal authority to grant diplomas in horticulture to those qualified and passing examinations during the course of a special training. The Institute is an organization designed to occupy a position with respect to horticultural matters in New Zealand comparable with the function of the Royal Horticultural Society in Great Britain. It has the active support of many of the leading horticulturists, and should play an important part in raising the status of New Zealand horticulture.

Imported Fruit, Plants, etc.

The examination of all imported fruit, plants, bulbs, &c., has been carried out during the year at the recognized ports of entry—viz., Auckland, Wellington, Lyttelton, Dunedin, and Bluff. The Inspectors report that the bulk of the consignments arrived in good condition. Several lines of

mandarins from Australia contained a large percentage of small, undersized fruit, which should not have been shipped. Fruit from the Cook Islands was landed in good condition, with the exception of a few consignments of oranges which arrived in a wasty condition. Several lots of oranges, passion-fruit, and potatoes from Norfolk Island arrived in splendid condition, and were of first-rate quality.

It was found necessary to condemn and destroy a number of cases of citrus fruit from Australia and the Cook Islands on account of fruit-fly infection. A quantity of walnuts and almonds was condemned under the Pure Food and Drugs Act as being unfit for human consumption. Fumigation was found necessary in connection with several lines found on inspection to be infected with live scale and mealy bug.

Regulations were gazetted during the year governing the importation of potatoes into New Zealand. These are designed with the view of improving the position of the potato industry from the disease point of view, including the raising of clean seed.

Hop-culture.

The hop crop was a good average one. Owing to the prolonged spell of dry weather during the summer months the majority of the hops when dried were light in weight, and consequently not so valuable. A number of gardens have been cleared to make way for tobacco-culture—an industry which is making rapid progress in the Nelson District.

The quantities and values of hops exported during the last five years ended 31st March, are as follows: 1924, 3,883 cwt., £27,615; 1925, 4,469 cwt., £31,112; 1926, 3,608 cwt., £21,780; 1927, 2,937 cwt., £15,203; 1928, 4,980 cwt., £29,539.

Tobacco-culture.

The cultivation of tobacco-leaf has been very profitable to the few at present engaged in this industry, practically the whole output being absorbed in the Dominion, and their success has led to a very considerable inquiry from all northern districts. Those interested have been supplied with suitable seed and directions for making tests of their land and climate for this crop. There are indications that a considerable area in many localities is suitable for this class of production. In many instances it is the poorer class of land that has otherwise very limited possibilities of becoming profitable. The services of the Department's Tobacco Instructor have been in considerable demand, and he has been kept busily engaged giving advice on the different phases of the industry in various localities. It is estimated there are now some 450 acres under tobacco in the Dominion.

Approximately 7 cwt. of tobacco-leaf was exported in July last from the Nelson District under the Government guarantee for the purpose of testing the London market. The prices realized were very encouraging, and a very useful report was obtained which will be of great assistance when the time arrives for making further shipments.

Legislation.

The following Acts affecting the operations of the Division were passed during the last session of Parliament: Orchard-tax Act, 1927; Apiaries Act, 1927; Seeds Importation Act, 1927; Fungicides and Insecticides Act, 1927; New Zealand Institute of Horticulture Act, 1927; Introduction of Plants Act, 1927.

The Beekeeping Industry.

The season of 1927–28, as regards production, was the best on record for many years past, all districts producing good crops. The opening months were extremely trying, boisterous winds and continuous wet weather preventing the bees from working the early nectar-secreting plants. This was followed by a prolonged spell of particularly fine weather. Taken altogether, the season has been a combination of the worst possible conditions and most suitable weather from the beekeepers' point of view.

In the North Auckland districts fair to good crops were harvested, despite the extremely dry weather experienced during the late summer months. Honey crops in all other beekeeping districts were well above the average, and, as is usual in a good season, the quality was of a high standard.

There is evidence on every hand of greater production and increased prosperity among the beekeepers. The 1927 Apiaries Act, adding, as it does, increased protection to the progressive apiarists, will no doubt encourage them to extend operations. A factor that is helping considerably to increase the production of honey is the growing practice among farmers to top-dress pastures. This is noticeable in certain districts of the North and South Islands, where its general effect in increased returns is already evident.

The activities of the Apiary Instructors have been well maintained, notwithstanding that their work was seriously handicapped by the prevalence of wet weather in the spring. Requests for lectures and demonstrations have been met in all districts, and the services of the officers have been given to judge the honey classes at the various shows held in their respective districts. A number of practical beekeepers were again engaged during the past season as part-time inspectors to assist with the inspection of apiaries for disease in portions of the Auckland, Wellington, Canterbury, Otago, and Southland districts. The work in this connection has, as a whole, been carried out in a very satisfactory manner. It was found necessary to take proceedings during the year against a number of persons for failing to take steps to control disease, using box hives, &c.

In connection with the alleged honey-poisoning cases in the Whakatane district, a botanical survey of the Kutarere district was carried out by two officers of the Division with the view of

obtaining particulars relative to the flora of that locality. Useful information was obtained, which should prove valuable in the event of a more complete survey being undertaken next year. A case of alleged honey poisoning which occurred at Morrinsville was investigated, and samples of the honey obtained and forwarded to the Department's Chemist for analysis.

Some 9,589 cases of honey were passed and graded for export at the various grading-stores by the Department's Honey-grader during the past season. The bulk of the honey was of prime quality, and the packing well up to the requirements of the regulations. A few lines were rejected on account of not being in a suitable condition for export. Honey exported during the year amounted to 8,650 cwt., valued at £27,784. Quantities and values of honey exported from the Dominion during the last five years are as follows: 1924, 9,157 cwt., £26,910; 1925, 10,836 cwt., £30,549; 1926, 15,770 cwt., £51,733; 1927, 10,590 cwt., £34,695; 1928, 8,650 cwt., £27,784.

Registration of Apiaries.

The law relating to the bee industry in New Zealand was consolidated and amended during the last session of Parliament. The Apiaries Act, 1927, provides that no person shall keep bees after the 31st March, 1928, except in an apiary registered under the Act. It is estimated some 5,000 apiaries are registered to date under the new regulations, representing approximately 60,000 colonies of bees. There still remains a considerable number of registrations to come in.

Staff.

I have to thank all officers of the Division for their loyal assistance in carrying out the many and varied duties during a particularly busy year.

FIELDS DIVISION.

REPORT OF A. H. COCKAYNE, DIRECTOR.

Season and Crops.

The early part of the past agricultural year gave every promise of an extremely good season, but unfortunately a prolonged dry period was experienced during the summer and early autumn. This dry period rather upset calculations, and in some districts it was found necessary to utilize at least some of the hay and ensilage saved for winter feeding. However, after the dry period broke, excellent growing-weather was experienced and the leeway in production was made up.

The season's cereal harvest has proved to be an exceptionally good one so far as actual threshings to date have disclosed. While actual figures are not yet available, it is estimated that 270,000 acres of wheat were sown, as against an actual sowing of 220,083 acres in the previous season. For the 1926–27 season the 220,083 acres yielded a total of 7,952,442 bushels, or 36·13 bushels per acre. The estimated Dominion average yield per acre for 1927–28 was 34·37 bushels, or approximately 9,200,000 bushels total yield. Actual threshings to date show that the yield per acre is 39·08 bushels, which is approximately 4·71 bushels above the estimated yield. At the yield of 39·08 bushels per acre, 6,400,249 bushels have been secured up to the present. This yield is obtained from about 163,800 acres. This leaves approximately 106,000 acres still to be threshed. Even if the average yield of this 106,000 acres dropped to between 26 and 27 bushels the total yield would equal the estimated 9,200,000 bushels. It is hardly likely that the average for the remaining 106,000 acres will drop from 39·08 bushels (obtained for the first 163,000 acres) to 26 or 27 bushels, and I feel confident our actual wheat-supply will exceed the estimated supply, and provide more than sufficient wheat for the Dominion's requirements.

So far as the oat crop is concerned, threshings to date average 45·6 bushels per acre. This is about 3 bushels per acre above last season's actual yield, which was approximately 5 bushels per acre above the Dominion average for the previous five years. The area in oats for 1927–28 was estimated at 312,000 acres, as compared with 372,698 actually harvested in 1926–27. The position in respect of oats and oaten chaff is very satisfactory.

The area in potatoes in 1927–28 was estimated at 22,200 acres, as against the actual area of 24,616 acres in 1926–27. Basing the yield on the average yield per acre for the last five years, it is estimated that for 1927–28 there will be a total of 118,500 tons of potatoes. This will leave a fair quantity above Dominion requirements available for export; but at the present time the prospects of an export trade, in view of Australia's embargo on New Zealand potatoes, are not very bright. A market for a quantity is offering in the Argentine, and 700 tons have already been shipped to that country.

The top-dressing of grassland with phosphatic manures is an operation which is receiving more and more attention each year. An extension of the practice must be reflected in an increased output of the Dominion's primary products—the more so as the top-dressing of grassland is not being restricted to areas on which manures can be applied by machinery, but is extending to hilly sheep-country, where the fertilizers have to be applied by hand. In this latter connection, the patent distributors which enable a man to cover a much larger area per day, and with greater comfort than he could otherwise do, are largely responsible.

Second-growth Country.

The experimental work on the hilly country reverting to secondary growths in the centre of the North Island has been carried on, particularly in the Whangamomona County, and full reports have been published, as the information became available, in the Department's *Journal*.

The Lands Department is now conducting a demonstration farm in the Whangamomona County under the provisions of the Deteriorated Lands Act. This farm is being run on economical lines, but, with the work that is being put in to it on good-management methods, considerable improvement both as regards carrying-capacity and appearance is already being shown. The instructional officers of the Division continue to co-operate with the officers of the Lands Department in the work necessitated in connection with advances under the Deteriorated Lands Act, particularly in the King-country.

Instruction in Agriculture.

The demands for instruction and advice received from the farming community of the Dominion are increasing rapidly, and it is pleasing to record that the instructional staff was strengthened during the year by the appointment of several additional Instructors. Without this additional assistance the work of the Division could not be carried out either with satisfaction to the Department or to the country in general. It is evident that the instructional staff will still have to be strengthened from time to time as suitable men are offering for appointment.

Farm Economics.

The farm-economics section of the Division is making fair headway in its work, and two articles were published in the Department's *Journal* during the year. A bulletin dealing with a survey of over 200 dairy farms in the Waikato and Taranaki districts is now almost ready for the press. The securing of sufficient data to enable a proper examination to be made in respect of any particular branch of farming is a work of some magnitude, and rapid progress cannot be expected. At the present time two officers of the farm-economics section are wholly employed gathering data in confined districts, and both officers report that the farmers generally are quite prepared to supply data when the object the Department has in view is explained to them. One looks forward with hope to the farm-economics section being of considerable help in the near future in improving the general standard of farm-management methods in the Dominion.

Experimental Farms and Areas.

Puwera.—Dairying operations were continued on this area, and the herd increased to thirty-eight head. The results secured from the herd are conclusive evidence that the clay gum-lands of the North are capable of being converted into small dairy farms, provided finance is available for the initial breaking-in of the land. A full report of the operations at Puwera for the 1927–28 season will be supplied later as a special report.

Marton.—The work at this area, which comprises mainly wild white-clover seed production and an elaborate series of top-dressing trials, has been much on the same lines as last year. Full details will be supplied later in a special report.

Ashburton.—The work carried out on this farm in former years has been continued. This work consists mainly of wheat-variety trials and work in the selection of pure lines of seed potatoes. A special report will be supplied later.

Gore.—Variety-testing of roots and potatoes represents the main work of the year on this area. In the case of roots the work is particularly from the aspects of dry-rot and club-root.

Galloway.—Dairying operations have been continued at Galloway to demonstrate the butterfat capacity of irrigated soil in Central Otago. A detailed report will be submitted so soon as the season has closed.

Waimaunga.—Dairying has been continued on this farm during the year, and so soon as the season closes a detailed report will be furnished.

Subsidized Farms.—The subsidized farms at Stratford, Manaia, Dargaville, and Winton have continued to do much useful demonstration work.

Co-operative Experiments.

Co-operative experimental work has been continued in various localities throughout the Dominion. The majority of these experiments are conducted on modern lines, under which the results can be accurately interpreted by the statistical method; but a few of the experiments—more especially those in isolated districts—have been of a demonstrational character.

Winter Farm Schools.

The holding of farm schools was continued during the winter of 1927. In nearly every case the classes were limited to two days in each centre, and the attendances at all lectures and the interest shown by those attending were most gratifying to the lecturers. On account of the period at each centre being limited to not more than two days, lecturers were enabled to visit an increased number of centres, and consequently a larger number of farmers attended the lectures than would otherwise have been the case.

Ruakura Farm Training College.

This institution continues to fill a long-felt want, and about thirty-five students are at present in residence. The course, which was formerly a two-year one, has been cut down to a one-year course, and as much practical instruction as possible imparted to the students.

Boys' and Girls' Agricultural Clubs.

These clubs are still continued in various districts in the Dominion, particularly in Taranaki, Wellington–West Coast, and Wairarapa districts. They are doing good work. Unfortunately, the running of the clubs takes up a considerable amount of the time of the Instructors in Agriculture in the districts mentioned, and I propose to go into the whole matter very shortly with a view to ascertaining whether some other satisfactory means whereby less time of the senior Instructors in Agriculture would be taken up cannot be devised.

During the year a handsome challenge shield for competition in connection with boys' and girls' agricultural clubs was kindly donated by Messrs. Henry A. Lane and Co., Ltd., London, through their New Zealand agent, Mr. G. H. Buckeridge, of Hawera. The thanks of the Department are due to the donors for their kindly action. In addition to this shield, a challenge cup, presented some years ago by Mr. Stuart Wilson, Wellington, is annually competed for.

Farmers' Field Competitions.

These competitions continue to be carried out, and in certain districts, particularly in Taranak and in Wellington-West Coast, they take the place of co-operative demonstration plots. Interest in the competitions is well maintained and their value to the farming community is undoubted. It has been arranged that in future, in addition to judging these competitions, the Department will definitely associate itself with the movement by giving certificates of merit to the first-, second-, and third-prize winners.

Certification of Field Crops.

During the year the Department arranged for work in connection with the certification of seed potatoes and seed wheat to be put in hand in Canterbury. The object of certification is to supply information that will enable merchants and growers to obtain seed that is true to name and reasonably free from seed-borne diseases. In the case of seed-wheat certification, the Department has co-operated with the Department of Scientific and Industrial Research through the recently formed Wheat Research Committee. There is no doubt that certification will have a far-reaching effect, and the practice will extend to other crops in the near future. The experience gained in the certification of wheat and potatoes during the 1927–28 season will be invaluable so far as extending the scheme to include other crops is concerned.

The Hemp Industry.

The principal phormium areas are reported as healthy in regard to the condition of the plant but, unfortunately, the industry is not in a flourishing condition, mainly on account of the fall in prices combined with the high cost of production. Several companies are at present operating in the Dominion in the growing of *Phormium tenax* under cultivation; but it will be some few years yet before any considerable area of cultivated *Phormium tenax* is available for milling. During the year Mr. W. H. Ferris, Hemp-grader, was detailed to carry on instructional duties among the numerous flax-mills, and many millers have expressed their appreciation of the Department's action in placing the services of Mr. Ferris as an instructor at their disposal. It is anticipated that as a result of the work of Mr. Ferris as an instructor a considerable improvement in the quality of hemp coming forward for grading will be noticeable.

The production of fibre during the year has shown an increase when compared with the previous year. The amount of hemp graded for the year ended 31st March, 1928, was 89,130 bales, as compared with 87,871 for the previous year, an increase of 1,259 bales. The quantity of tow graded was 26,557 bales, as against 25,445, an increase of 1,112 bales. Of stripper tow 1,548 bales were graded, as compared with 2,079 for the previous year, a decrease of 531 bales. The number of bales of stripper-slips graded was 2,373, as against 2,629, an increase of 256 bales.

Of the hemp graded, 6·56 per cent. was good-fair, 33·26 per cent. high-fair, and 45·01 per cent. low-fair grade; 12·18 per cent. of the tow was first grade, 56·93 per cent. second grade, and 27·63 per cent. third grade; stripper-tow was 12·27 per cent. first grade, 70·93 per cent. second grade, and 14·4 per cent. third grade; of stripper-slips 5·89 per cent. was first grade, 30·55 per cent. second grade, while 59·96 per cent. (which was below first and second grade) was allowed to be exported for use mainly in the manufacture of cheap lashings, for which it has been found useful.

Biological Laboratory.

A prominent feature of the year's work has been the discussion of various means of reorganizing, locating, and accommodating the Laboratory, so that greater facilities might be given for its increasing activities and that it might be advantageously co-ordinated with allied institutions that have recently been established. The first fruits of this work are to be seen in the removal of a section of the Laboratory to Palmerston North, here to form the nucleus of a new organization, the Plant Research Station. This first step was precipitated largely on account of an urgent need for land for experimental purposes. Later it is intended to associate with this new organization the scientific staffs and functions both of the Biological Laboratory and of the remainder of the Fields Division.

Agricultural Botany.

There has been a large increase in the numbers of weeds, grasses, and other forage plants, and of Native plants, received for identification from all parts of the Dominion. The main inquirers are farmers, seed firms, school teachers and children, and officers of the Department. In regard to the latter it is satisfactory to note that there is a growing realization among them of the necessity of being able to distinguish accurately between the different plants—useful and otherwise—with which they have to deal. This requires a knowledge of the characters separating species superficially alike but often of quite different importance in practical agriculture. In this connection is the use of the botanical name of definite meaning, in conjunction with—not necessarily instead of—the common name, which is often of the vaguest application and has caused much confusion in the past.

In view of the increasing importance of the systematic side of the botanical work, particular care is being given to the herbarium, and a great many new specimens are being added to it, while much has been done as regards its arrangement and preservation.

In the matter of weed-control, local facts in the ecology of the plants concerned are of the greatest importance. Acknowledgments are due to many of the field officers of the Department, whose memoranda covering specimens forwarded for indentification are valuable in this way. Particular use is often able to be made, for example, of the correlation of a series of facts received about an individual species growing over many different types of country.

Blackberry Investigation.

No marked developments can be reported in connection with the offer of £10,000 as a bonus in connection with the control of blackberry. Various spray fluids not previously tested have been applied. So far such means of control seem applicable only to certain types of blackberry land. The value of goats as a means of control has been sustained, as also has the advantage of cutting at certain seasons rather than at others. Control by natural enemies, such as by insects or fungi, has so far not materialized—in fact, no single specific implement, method, or organism is as yet forthcoming for dealing successfully with this weed in the variety of locations and circumstances in which it is found. Rather, it would seem, must different means be devised for control according to its various forms and habitats.

Entomology.

The work of the entomological service has been extended officially to include forest entomology; for this purpose an additional assistant was appointed. In consequence the year's work can be grouped as follows:—

(1) *Agricultural.*—(*a*) Sheep maggot-flies: A monograph on the sheep maggot-fly position in New Zealand was prepared, and deals with the systematic and economic aspects of the question: this work (some 200 pages in all) will be published in two parts. Experiments with various chemical preparations, in the form of dips, were carried out, but the results have been negative so far. Considerable success was attained in the rearing of the maggot-parasite, *Alysia manducator*, secured from the Imperial Bureau of Entomology, London, and extensive liberations have been continued. (*b*) Grass-grub parasite: One of the *Tachinidæ* attacking melolonthids in North America has been imported for the purpose of attempting its establishment against the New Zealand grass-grub. Large consignments of the North American larvæ infested by the tachinid were secured through the courtesy of Dr. Arthur Gibson, Dominion Entomologist at Ottawa, and successfully landed in New Zealand. From these consignments considerable numbers of tachinids were reared, some of which were liberated in the field, and others in a large insectary, the grass-covered floor of which was infected by the New Zealand grass-grub. (*c*) Subterranean grass caterpillars: Studies of these insects were undertaken to ascertain the seasonal and geographic range of the species in question. (*d*) Earwig-control: The hedgehogs liberated at Alexandra during the 1927 season were found not to be established, and to have died out. The experiments with poison gave very satisfactory results, and it would seem that method will eventually prove to be the most effective method of control. (*e*) Pear-midge control: It is definitely ascertained that the pear-midge parasites have become established and have already shown conclusive signs of controlling the midge.

(2) *Forest.*—(*a*) Forest-insect survey: A survey of the insect conditions in the exotic forests throughout the Dominion was commenced, and Canterbury, Taranaki, and the southern part of the Auckland Province have been completed. (*b*) Timber-weevils: A special study of the weevils attacking the milled indigenous timbers is being made, with the object of formulating control measures at the timber-mills. (*c*) Gum-tree weevil: Through the courtesy of the South African Entomological Service a mymarid egg-parasite of the gum-tree weevil was imported from Australia, successfully reared, and liberated throughout New Zealand. (*d*) Gum-tree scale: Distributions of the ladybird *Rhizobius ventralis* were made in several localities where the scale was epidemic. (*e*) Steel-blue sawfly: Two parasites of this insect have been located in England and have been studied at Farnham Royal. The first consignments are expected in New Zealand this spring and summer.

Mycology.

Work on cereal-smuts control during the year was directed in part towards modification of the present hot-water treatment in use, with a view to lessening the risk of loss through damage to seed. The fourth season's experiments on smut-control have shown conclusively that control is possible through treatment of small lines and bulking these aseptically until a sufficieny has been obtained for commercial distribution. As an example, it may be said that all malting-barely grown in the Leeston district of Canterbury is this year free from covered and loose smut.

Field experiments with take-all again failed through the disease not appearing in the control plots. Further work on this disease has been postponed pending the erection of suitable glass-house accommodation. The third cereal-disease survey was carried out through December and January in the districts of Marlborough, Canterbury, Otago, and Southland. As a result it was found that oat-smut was practically absent from Otago and Southland, principally because of the widespread use of the formalin treatment recommended by the Laboratory. Valuable data were obtained concerning the field distribution of the cereal rusts, take-all, and root-rots of wheat and oats. Scab was found to be of slight economic importance, being confined to a few areas where rainfall was heavier than usual.

Experiments with corticium disease of potatoes have been carried through another season, with the result that a considerable quantity of tubers free from this disease has been secured. In plot experiments appreciable increases in yield were obtained over untreated potatoes. Dry dust treatments on the control of this disease proved under field conditions to be useless, even the best of the treatments having a high percentage of viable sclerotia present when the tubers were lifted.

Work on dry-rot of swedes was continued, being mostly in the nature of improved methods of seed-treatment. Several plot areas were run—as, for example, at Gore, where seed of brassicas grown on the farm was treated before sowing. At the time of writing no dry-rot has appeared, though crops in the neighbourhood are generally infected.

A commencement has been made with experimental work on control of club-root of swedes, turnips, and rape. As a preliminary a detailed survey was conducted throughout the Wairarapa, Hawke's Bay, Manawatu, and Taranaki districts. As a result such information was secured as will enable laboratory and field experiments to be carried out on an extensive scale during the forthcoming season.

Work has been continued on the systematics of New Zealand fungi, numerous papers on this class of work being published in scientific periodicals during the year. Considerable material has been added to the herbarium, particularly of rusts and smuts on indigenous hosts.

The usual routine-work—principally identification of plant diseases—has been carried out during the year. This is steadily increasing in amount, largely due to the more active interest farmers and instructors are taking in disease control work.

Fruit Cool Storage.

Most of the fruit cool stores in New Zealand were visited from time to time in the interest of fruitgrowers and for the purpose of putting into practice certain methods that have been shown to succeed by past experimental work

At the request of the Hawke's Bay Fruitgrowers' Association the supervision of the storage of seventeen thousand cases of Sturmer Pippin apples was undertaken at Westfield, Auckland, where the Department's methods were carried out in detail. The fruit kept most satisfactorily, the last unloaded having been successfully stored for two months longer than is customary in England.

Further experiments were carried out with specially selected apples from three different localities in Hawke's Bay. The fruit from each locality was stored in six different stores in Auckland and Hawke's Bay: such fruit being comparable in all stores, the relative merits or demerits of each store were demonstrated. Advice was given for future improvement. This work is having the effect of generally modifying and improving the methods of cool storage in practice. These experiments also demonstrated the better storage quality of one line as compared with another. The greater susceptibility to flesh-collapse of the larger-sized apples as compared with the smaller ones showed the necessity for so stacking the fruit that the larger sizes might in all cases be watched most carefully and be promptly unloaded if necessary. The post-storage experiments showed that certain lines ex cool store deteriorate more rapidly than others; that stem-rot was the chief cause of such deterioration, and that the exterior apples of a wrapped case suffer less than the interior apples. This work is to be carefully followed up on new and original lines next season.

A tour of the cool stores of Auckland, Hastings, Nelson, and Christchurch was made with Dr. Franklin Kidd, of the Low Temperature Research Station, Cambridge, England. Fruit under experiment was cut for his examination at various stores. Under certain storage conditions no sign of flesh-collapse was found, the fruit at that time having been successfully stored for seven months.

As a result of Dr. Kidd's visit, lines of communication have been strengthened between refrigeration investigators in New Zealand and those operating in his excellently appointed station at Cambridge. Moreover, he has undertaken to examine and report upon a quantity of fruit which is being despatched to him in connection with an extensive set of experiments devised in New Zealand to ascertain the effects of various storage systems and conditions in different vessels upon the keeping of New Zealand apples in transit to England. The selection of the orchards and the picking and packing of the fruit is now in progress. The results should be available for next annual report.

Mr. R. Waters, Plant Pathologist and officer in charge of the Biological Laboratory, who has been responsible for this work, has received an appointment to the Massey Agricultural College. Arrangements will therefore require to be made for the continuance of the work in the future.

Agrostology.

The experiments on regrassing secondary-growth country and inquiries into the best methods of bringing deteriorated hill country back have been continued, and articles relative to the above have been published in the *Journal*. The past summer and autumn have seen many thousands of acres of secondary growth burnt and sown, and it is pleasing to report general acceptance by the farming community of the hardier grasses and clovers such as brown-top, Danthonia pilosa, and Lotus major, as important ingredients of the seed mixtures sown. This, it is felt, is essentially a step in the right direction. There are still minor differences of opinion as to how much seed of each should be included in the mixture, and many are inclined to adhere to cocksfoot even on the poorer and harder secondary-

growth country. It matters little whether cocksfoot is sown or not; the essential thing is to get from [½ lb. to 2 lb. brown-top, 3 lb. Danthonia pilosa, and ½ lb. Lotus major included in the mixtures sown. Crested dogstail is of outstanding merit for the first three years, and from 3 lb. to 4 lb. should be included; ½–1 lb. white clover, and 6–8 lb. perennial rye-grass included in the mixture provide rapid feed, but these will not last excepting under top-dressing. Other species, such as paspalum, yarrow, kikuyu, and subterranean clover, may also be worth while. A large amount of experimental plantings of kikuyu has been made on hill country in Taranaki.

In hill-country work, as compared with that on easy ploughable country where modification of the soil habitat by ploughing, reseeding, manuring, and tripod-harrowing is possible, it is a question of choosing species adapted to the soil conditions as they exist or come to exist after the burning-off of the rubbish, and the more the question is studied the more important loom those species that can persist and spread under low soil-fertility standards; those that will persist in the shade of secondary growth should this get temporarily out of control; those that will carry a fire and that will recover rapidly once the area has been burned off. Lotus major, paspalum, brown-top, Danthonia pilosa, yarrow, New Zealand rice-grass, and Poa pratensis are outstanding in this respect.

Systematics of Grassland Associations.—The systematics of grassland associations has received some careful consideration, and it is hoped ultimately to map each district according to the natural grassland associations that the soil of that district can support. The classification of association type is a piece of fundamental groundwork that should be done prior to the inauguration of any work that bears on grassland. It is fundamental to such work as—(1) Soil survey, chemical: From a grassland point of view it is the chemical relationship of the soil to the grassland association that that soil is producing that is all-important. It is a soil survey of soil-types defined by the sward that that soil-type is producing that is required. (2) Soil survey, biological: The bacterial and other life of grassland association types should go hand in hand with the chemical, and here again it is the fauna of the grassland associations and the differentiation in the life of the various association types that need determination. (3) Mineral and total foods content of pasture herbage: It is fundamental to the determination of mineral and total foods content of pasture herbage that the herbage of each species analysed be collected from known and recognizable grassland associations. An analysis, for example, of cocksfoot growing within a rye-grass - white-clover dominant sward may be an entirely different thing chemically from a cocksfoot growing in a danthonia-dominant sward. Soil surveys and pasture-herbage analyses are being made by the Chief Chemist, and to my mind it is imperative that this work should be correlated with association type. (4) Top-dressing response: The co-ordination of association types with response from application of artificial manures may lead fairly rapidly to generalization of just which association types pay best to manure, and approximate cost of changing by manuring of one association type to another. In all this work it would seem imperative that some measure of the association should be made prior to any of the foregoing work and during the course of such experiments. The identification of the association then is fundamental.

Point Quadrat Method of defining Grassland Associations.—Several inquiries from abroad for information regarding the above method have been dealt with, and some work has been done during the past year towards proving mathematically the efficacy of the method.

Modification of Grassland Soil-types.—During the past year the Department has initiated experiments that ultimately it is hoped may be carried out on all the leading soil-types to determine under ordinary grazing just what are the conditions necessary on each soil-type to attain rye-grass and white-clover dominance. The scheme consists in sowing rye-grass and white clover and one other additional species per plot, and in manuring these on each soil-type to the point that rye-grass and white clover become the dominant herbage of the pasture irrespective of what was sown. The modification of the habitat so as to provide conditions suitable for high-production species to thrive lies at the root of pasture-improvement.

Consideration of Strain in Relation to Pasture Plants.—The conditioning of all the better soil-types at least towards the rye-grass and white-clover ideal is looked upon as being the best immediate method of increasing production from the sown grasslands of New Zealand. An aspect of equal importance for areas to be sown in the future is the consideration the farmer should give to strain. Work has already been initiated to test out all the commercial strains of grasses and clovers at present securable in New Zealand, both locally grown and those imported. As the work develops it is hoped to segregate the best commercial strains of each and ultimately to work up pedigree strains.

Official Seed-testing Station.

During the twelve months ended December, 1927, 10,768 seed-samples were tested, representing an increase of 2,141 samples over the number for 1926. The total was made as follows: Commercial samples, 8,959 (2,107 increase); farmers and seed-growers, 233 (166 decrease); Government Departments, 351 (62 increase); laboratory tests, 1,078 (134 increase); retests, 147 (4 increase).

This work entailed the making of 10,509 germination tests and 3,127 purity tests, showing an increase of 23 per cent. in germination work, 65 per cent. in purity work, and an over-all increase of 31 per cent. over the work done in 1926. Owing to the lack of additional accommodation, the staff could not be increased, so that the handling of this large number of samples must be regarded as an indication of the high efficiency of the members of the staff, who gave up a considerable amount of their own time throughout the year.

The distribution of the samples received was as follows: Southland, 3,377 (1,398 increase); Wellington, 2,323 (423 increase); Canterbury, 1,680 (538 increase); Auckland, 1,066 (254 decrease); Otago, 602 (3 increase); Marlborough, 228 (99 increase); Hawke's Bay, 213 (15 decrease); Taranaki, 129 (70 increase); Gisborne, 47 (38 increase); North Auckland, 24 (21 increase); Nelson, 1 (7 decrease); Westland, nil.

Rye-grass, particularly that from the South Island, has been considerably poorer in germination than the average. The cause may have been the higher rainfall of the past year, but there is a rather widespread idea that top-dressing has had some effect in this direction; and it has been suggested that the Department make some investigation into the effect of various top-dressing fertilizers and different harvesting methods. It is proposed to carry out this work for the 1929 harvest. There is good reason to believe that there is a tendency to harvest top-dressed crops rather too early, but the whole matter requires definite field investigation.

The 1927 season was an excellent one for both crested dogstail and Chewings fescue, 80 per cent. and 70 per cent. respectively of the samples tested growing 90 per cent. or over. The export demand for fescue was unprecedented, and stocks were cleared well before the end of the year. The demand for dogstail was not so good, the retail price falling considerably from the hitherto high figure. Consequent on the Department's investigation into the loss of vitality in export Chewings fescue, the growers were advised to delay harvesting operations as long as possible, so that the seed might more nearly approach complete maturity. The indications are that this has been generally carried out, and in consequence no complaint has reached us regarding failure of any shipments. During the year Messrs. Du Pont Co., of Wilmington, Delaware, U.S.A., asked if the Department was prepared to carry out shipment trials with Chewings fescue dusted with Semesan, they being of the opinion that seed so treated would not deteriorate. In May of this year the first of a series of trial parcels of seed treated with Semesan was forwarded to Washington, U.S.A., and to Cambridge, England, where the seed will be stored and tested at regular intervals. Should this dusting treatment considerably improve the storage capabilities of fescue, it is possible that the treatment could be used with advantage with other export seeds, principally dogstail.

It is intended to make a survey of the weed flora of the seed-producing areas in New Zealand in relation to the occurrence of the weed-seeds in seed-samples, both undressed and machine-dressed. Work has been commenced on white clover, and arrangements have been made for the collection of samples of white clover from the principal seed-producing areas throughout New Zealand. Surveys of this type are in progress in many other countries, and prove of value in accurately ascertaining the place of origin of lines of seed.

In addition to the routine purity and germination tests, 130 special tests for the purpose of the Canadian Seeds Act were carried out. New Zealand exporters have expressed their appreciation of this system, whereby any line under shipment to Canada may be given a Canadian port clearance certificate prior to shipment; also provisional grading figures. This Canadian system is frequently contrasted with the Australian Quarantine Act, under which there appear to be no quality standards, import shipments being allowed or refused entry at the discretion of the port quarantine officers. New Zealand exporters have expressed their willingness to conform to any reasonable Quarantine Act, but in the absence of definite standards of purity and germination trade with the Australian States is at times a most uncertain business, for the reason that the shipper cannot foresee whether even a good average line may be allowed entry. It would be in the best interests of both the shipper and the importer were import standards instituted by the Federal authorities.

Under the uniform system of testing and reporting proposed by the International Seed-testing Association, New Zealand, as a member, will be required to make a considerable number of special analyses on export lines. This will necessitate our strict adherence to the European system of testing, and it will therefore be necessary to make provision in staffing and equipment in the near future. These international certificates will be recognized in any country, and will be directly comparable with analyses made therein. This will result in the removal of many of the difficulties encountered in the export trade at the present time.

Apart from the routine testing-work, full records have been taken of all the purity- and germination-test percentages, the tabulated results being issued quarterly to the seed trade. Approximately 200 seed-samples were identified, and advice given to growers and merchants regarding seed-production, quality standards, and matters relating to export and retail generally. One firm is being co-operated with as to the value of various chemical agents and cool temperatures in relation to the storage of vegetable seeds. Approximately 800 germination tests were made on behalf of the mycological section in connection with its investigations into the control of cereal smuts and dry-rot of swedes and other seed-borne diseases.

A series of referee samples was tested on behalf of the International Seed-testing Association, eighty-seven other stations participating. The results recently to hand show that the work of the New Zealand station compared very favourably with that of the large European stations.

Departmental Photography.

During the year a large amount of photographic work has been carried out in the Laboratory. A new departure for the year was the making of transparencies for show exhibits, and the provision of photographs for publicity purposes. This latter included a special set of enlargements for display in the office of the High Commissioner for New Zealand, in London, and a set of agricultural views for publicity cards in cigarette packets. Several visits were made to other districts, such as Blenheim and Raglan, to obtain photographs, principally for pastoral scenes, Ashburton and Marton for experimental plots, Ruakura and Wallaceville for stud stock, and Auckland for apple-diseases. The routine work showed a general increase in printing (including enlargements) and in the number of photographs taken. The demand for lantern-slides for instructional purposes also greatly increased, the number made during the year being 2,096, as against 1,349 last year.

Staff.

I desire to thank all members of the staff for their cordial co-operation in the carrying-out of the many and varied phases of the work coming within the scope of the Division.

CHEMISTRY SECTION.

REPORT OF B. C. ASTON, F.I.C., F.C.S., CHIEF CHEMIST.

Mineral Content of Pastures.

Deficiency disease in stock, attributable to mineral deficiency in the pasture, has received a large share of attention during the past year. The work in New Zealand on iron-starvation already published was mainly instrumental in obtaining for New Zealand a grant from the Empire Marketing Board for the further investigation of the mineral content of pasture. One of the conditions of the grant was that certain types of officers should visit the Rowett Institute and spend some time in investigating the methods used at that institution. Mr. R. E. R. Grimmett, of this Department's chemical staff, left New Zealand at the end of April, 1927, and returned to New Zealand in March, 1928. Mr. T. Rigg, previously an officer of this Department's Chemical Laboratory, but now of the Cawthron Institute, Nelson, also visited the Rowett Institute for some weeks in 1927.

While at the Rowett Institute Mr. Grimmett investigated the "pining" disease in sheep which occurs in the Cheviot Hills and other localities in Scotland, a disease which the writer of this report predicted in 1924 would be found to be the same as "bush-sickness" in New Zealand. Mr. Grimmett found that there was a low iron-content of the pasture in "pining" districts as compared with districts in which there was no "pining"; that "pining" was curable by the same methods as adopted in New Zealand for the cure of bush-sickness—the administration of iron remedies—and that there were certain physiographical features of the "pining" areas which were distinct from the "non-pining" areas, features which were paralleled in the bush-sick districts in New Zealand. He also carried out pot experiments with "pining" and "non-pining" soils, and analysed the herbage grown on them, eliciting the fact that when the pots were placed under stagnant conditions requiring drainage there was an unusual absorption of manganese by the plants compared with pots in which free drainage conditions prevailed, while indications pointed to iron-absorption being similarly affected, though more slowly than manganese. This fact is again substantiated by the analysis of plants growing under stagnant conditions in the Rotorua district, where the same iron and manganese content was found, and where bush-sickness does not occur, but where sick animals make a speedy recovery. The influence of excessive manganese in the natural form will be tested in the field. The results of this work go to show the importance of increasing the water-holding capacity of pumice soils. The most obvious method would seem to be by increasing the organic matter or "humus" content by green-manuring, so frequently urged in past *Journal* articles.

The scheme of work to be undertaken under the Empire Marketing Board's grant for research on the mineral content of pastures will for the first two years be restricted to those areas where there is a definite and chronic malnutrition in domestic stock which cannot be referred to any other cause than the food-supply, which is apparently present in suitable amount for the normal maintenance and development of stock.

The general lines upon which the work is being carried out were laid down by Dr. Orr, of the Rowett Research Institute, as follows:—

(*a*) The analysis of samples of pastures, and, where considered desirable, of soils, to determine the mineral content of pastures in different areas and in different seasons.

The analysis of soil and pasture samples is being actively carried on in connection with the two distinct deficiency diseases (iron and calcium deficiency), and it is hoped to add a typical phosphate deficiency area at a later date.

(*b*) The correlation of minerals with other constituents and with the nutritive value of the pasture as determined by its carrying-capacity, and the health, rate of growth, and production of animals grazing on it.

Field experiments are being carried out in the direction desired.

(*c*) Feeding tests to determine the effect of feeding to grazing-animals mixtures of mineral salts or foodstuffs rich in minerals found to be deficient in the pastures.

(*d*) Experiments to determine where and to what extent information obtained under (*a*), (*b*), and (*c*) can be used for the improvement of pastures.

Further demonstration experiments are being initiated in both cases with a view to modifying the existing farming practice with regard to animal and soil treatment, so as to accord with the experimental work and the theories which have been deduced from it.

Temporary expert officers have been appointed, and it is hoped to appoint others to help in this work for a term of years.

Iron-starvation in New Zealand. (Bush-sickness.)

The use of iron-ammonium citrate as a medium for the prevention and cure of this deficiency disease in ruminant stock has increased greatly, about 4 cwt. having been sold by the Stock Inspectors at Rotorua and Tauranga during the past year, an amount which represents some 58,000 doses. The users of this remedy have been circularized, and their experiences published for the benefit of all in the affected districts. It is intended to try forms of iron other than this and the sulphate, both for stock-lick and for pasture top-dressings. Huntly iron carbonate (spathic iron-ore) is being thoroughly tried out, both as a top-dressing and as a lick.

An interesting fact was discovered on the writer's visit to the Atiamiuri Road Settlement on a silt type of soil quite different from the ordinary pumice types. Here there is no bush-sickness, and dairy herds give good returns. In addition to the fact of a large area of the land being of a

type hitherto not met with in the Rotorua County, it was found that the creek-waters naturally contained an amount of soluble iron salts sufficient to make the water distinctly chalybeate to the taste. This may be one of the reasons why the stock enjoy such phenomenal health and are so productive in the heart of this poor country.

Physiographical Report. — Arrangements which were made whereby Professor Cotton should examine and report on the physiography of the affected lands were carried out to a certain point, the work then being interrupted by Dr. Cotton's visit to Europe and America. A preliminary report has been received.

Other Deficiency Diseases.

There are, no doubt, diseases due to mineral deficiency other than iron in the North Island, and work has been commenced in three areas entirely detached from the Rotorua and adjoining counties—viz., in Waitomo County (two diseases) and in Otorohanga County.

A series of soil-samples collected in the Ngaroma district have been analysed and reported on. Field experiments in the top-dressing of pasture are in progress on a number of selected farms.

Mortality among Lambs in Central Otago.

The mortality due to what is known as "pulpy kidney" or renal congestion, occurring in lambs in Central Otago, has been further investigated in conjunction with the Live-stock Division. Additional samples of pasture and soils were obtained during the period of the mortality, and are being analysed. An article giving some preliminary results appeared in the *Journal*. The presence of albumin in some and sugar in other samples of urine from affected lambs was a new feature detected in connection with this trouble.

Soils.

The soil survey of Rotorua County has been continued and the top-soil map of the southern portion of the county was published in the *Journal*. A subsoil map of the whole county has also been completed for publication. Additional work is required in areas from which only a few samples have been taken, and this will be carried out as opportunity offers.

A further visit was paid to the deteriorated hill country of the Stratford - Whangamomona district, and a series of soil-samples collected for analysis. A considerable number of soil-samples have been collected and are being examined in the Laboratory, with reference to the malnutrition trouble in stock at Mairoa, near Te Kuiti. Samples have also been obtained from other districts in which deficiency in mineral nutrients is suspected.

The event of the year, in soil research, was the First International Congress of Soil Science, held in Washington, U.S.A., in June, 1927. The Congress was attended by the representatives of twenty-five countries, New Zealand being represented officially by Mr. T. Rigg, Agricultural Chemist and Assistant Director of the Cawthron Institute. The work of the Congress covered all phases of soil problems and crop-production, particular attention being given to methods of soil-classification. Special facilities were given to the delegates to visit the principal experiment and research stations and institutions.

A sample of soil from Kenya Colony was analysed, and suggestions as to manurial treatment were supplied. The sample was a clay loam, extremely deficient in total and available phosphoric acid, but well supplied with other plant-foods.

Fertilizers.

The number of unofficial samples of fertilizers received from purchasers for comparison with the vendor's invoice certificate is steadily increasing, thirty-four samples having been submitted during the year. In one case (that of a "special mixture") serious deficiencies were disclosed, and a substantial rebate was obtained by the purchaser. Seven samples were received from Inspectors under the Fertilizers Act. In no case did analysis disclose any discrepancy to the prejudice of the purchaser.

In my last report mention was made of the inauguration of a system of examination in London of samples from all shipments of basic slag exported from England and the Continent of Europe to New Zealand. During the last four months of the year samples of fifty-six consignments of slag were analysed at the Imperial Institute, with the following results: Slag with minimum guarantee 17 per cent. phosphoric acid—Complied with guarantee, 42; below guarantee, 4: slag with minimum guarantee, 20 per cent. phosphoric acid—Complied with guarantee, 3; below guarantee, 7. In only two instances, however, was the deficiency greater than 1 per cent. The importers of slag found to be below guarantee were notified of the Imperial Institute's results before arrival of the shipments. The citric-solubility of the basic slag was in all cases satisfactory. In one instance the fineness of grinding was slightly below the minimum guarantee of 80 per cent.

During the 1927 session of Parliament the Fertilisers Act, 1927, was placed on the statute-book. The new Act, which replaces the Fertilizers Act, 1908, provides, among other things, for complete disclosure of the components of fertilizer mixtures, in addition to the usual statement (now simplified) of the chemical ingredients. The measure prohibits the sale under the description of "fertilizer" of any material in respect of which a brand could not be registered under the Act, and provides for a simplified form of registration by vendors who do not import or mix their own fertilizers. Regulations under the Act are now in preparation.

The registration of vendors of fertilizers under the Fertilizers Act has been carried out as in previous years. The altered methods of registration under the new Act will in the coming year involve a considerable increase in the work of checking and certifiying the registration of brands, and in correspondence with vendors.

The statistics concerning the importation of fertilizers into New Zealand have been compiled and published in the *Journal of Agriculture* as usual.

Samples of a number of export shipments of meat-works manures have been analysed for the exporters, in order to comply with the purchasers' requirements of a Government certificate of the quality of each consignment.

Reputed Fertilizers and Phosphate Rocks.

None of the specimens forwarded for examination during the year was found to have any commercial value. Eleven samples of reputed guanos collected at White Island by Mr. Grange, of the Geological Survey, were analysed for fertilizer constitutents, with results which showed no sample to contain more than 3.44 per cent. phosphoric acid, or 0·49 per cent. nitrogen, while in most of the samples the amounts were much lower.

Limestones and Limes.

Eighty-eight samples of limestones and limes were examined and reported on during the year. Included in the number were samples of commercial ground limestones, which were found to be generally satisfactory in quality and fineness of grinding. Several samples of quicklime were also submitted. Following are brief notes on some of the more useful samples received :—

X/16–17, from the Chatham Islands, were calcareous breccias, containing 90·3 per cent. and 90·4 per cent. carbonate of lime, respectively. X/231 was a useful shelly grit from Otane, Hawke's Bay ; it contained 80 per cent. carbonate of lime, and was suitable for application to the land without further treatment. X/241, from Patarau River, Nelson, was an easily-pulverized calcareous sinter of high grade (95·5 per cent. carbonate of lime). X/242, from the same locality as X 241, was a hard yellow limestone, 91 per cent. pure, that would be excellent for " burning " to quicklime. X/246 was a friable shelly rubble from Te Aute, Hawke's Bay, containing 90·5 per cent. carbonate of lime. X/329, a soft calcareous sinter containing only traces of impurities, was from Marton Block, Apiti. X/399 was a coarse rubble containing 81 per cent. carbonate of lime. By screening off the larger lumps a very useful product could be obtained. This sample was sent from Maraetotara, Havelock North. X/502, from Iron Point, Hicks Bay, was a very hard, semicrystalline stone containing 91 per cent. carbonate of lime. X/541, from Whatutu, Poverty Bay, was a calcareous grit of exceptional purity (96.5 per cent. carbonate), which would require no treatment other than drying, if necessary, before application to the land. X/761, found at Greenmeadows, near Napier, was a friable shelly rubble containing 83·5 per cent. carbonate of lime. X/843, an easily crushed stone from Geraldine, Canterbury, contained 80·25 per cent. carbonate of lime. X/1099–1100 were from Manurewa, Auckland. The first, said to be present in unlimited quantity, contained 81·5 per cent., while the second, of which only a limited amount was apparent, contained the high proportion of 95·5 per cent. carbonate of lime. X/1083 was a calcareous sinter from Patoka, Hastings : it contained 97 per cent. carbonate of lime.

Investigation of Wheat and its Products.

Fifty-three samples of wheat were treated in the experimental mill this year, these including the samples from the 1926 harvest, which were not milled last year. The average yield of flour was very satisfactory, that for the 1927 harvest being slightly higher than for the previous year. In general the wheats were excellent in appearance ; no samples were more difficult to mill than the average, while several were easier. In the investigation of the flours produced from these wheats the average protein content was found to be markedly higher in the 1926 series than in those of 1927. The results of the work were published in the *Journal*.

The composition of New Zealand bran and pollard has been investigated, samples of commercial products being compared with the products of the Department's experimental mill. Details of the work were published in the *Journal*.

Toxicological.

Seventeen specimens of ingesta and organs from animals suspected of having been poisoned were submitted for examination. In several instances of mortality in pigs suspicious amounts of sodium chloride (common salt) were found in the stomach-contents. Strychnine was found in one case, powdered nux vomica having apparently been administered in mistake for a harmless drug to the animal (a dog).

Work for the Departmental Divisions.

Work done for the Live-stock Division has included the periodical testing of the strength of public cattle-dips from the Auckland and Taranaki districts, over two hundred samples having been examined and reported on. Materials for the use of field officers in making dip-side tests have been supplied as required. The investigation of the wool-branding fluids on the New Zealand market, relative to complaints that brands could not be removed by the usual scouring processes, has been completed. No tar or other undesirable materials were found in the twenty-two samples examined. Scouring-tests showed that when the fluid was not too heavily applied it was easily removed, but where the thick pigment from the bottom of the can was used a hard mass, more or less difficult to disintegrate by the usual scouring method, resulted. In such cases the wool could readily be freed from the pigment by brief immersion in a suitable solvent, such as carbon tetrachloride or benzene. A number of proprietary medicinal preparations for live-stock were also analysed and reported on.

For the Dairy Division analyses of dairy-products in connection with the general and special investigation work of the Division, and of cattle-licks, disinfecting and cleaning preparations, &c., have been carried out. The examination of skim-milk bottles used in the purchase of milk and cream under the Dairy Industry Act Regulations, and of dairy thermometers, has been continued, 390 bottles and 219 thermometers having been tested for accuracy during the year.

Further experimental work on the modification of fat content of milk in cheesemaking has been carried out by the Dairy Division in collaboration with this section. A sample of cheese-colouring suspected of containing coal-tar dyes was examined and found to be genuine annatto extract. The question of the possible contamination of cheese by boric acid derived from rennet-extract was inquired into. All the rennet-samples examined contained boric acids, but no trace of the preservative was found in the cheese-samples submitted.

For the Horticulture Division analyses have been made of fungicides and insecticides, honey, honeydew, &c. A sample of reputed poisonous honey, believed to have been gathered from tutu (*Coriaria ruscifolia*) was examined, but no tutin could be detected. Assistance in the preparation of the Fungicides and Insecticides Act was given.

Officers of the Fields Division have submitted samples of soils, fertilizers, limestones, pastures, &c., for examination and report. Advice and collaboration in chemical matters affecting their work has also been given to officers of all branches of the Department.

Other Work of the Section.

A large amount of consulting-work has been done by the writer and by Mr. F. T. Leighton. A statement of the research work of the Laboratory was prepared for presentation at the Imperial Conference of Agricultural Research. At the request of the Council of Scientific and Industrial Research, the writer acted in the committee appointed to deal with applications for the position of Dairy Research Chemist at the Massey Agricultural College.

Accommodation.

The matter of providing adequate accommodation for the work of this Laboratory has again been under consideration. The congestion in the Dominion Laboratory building has been somewhat relieved by the provision of a room in the neighbouring building of the Public Works Department, and further temporary relief will shortly be afforded by the transfer of the soil-analysis work to the building in Fairlie Terrace at present occupied by the Biological Laboratory. The disadvantages as regards effective supervision and co-ordination of work carried on in different parts of the city are, however, obvious, while the arrangement also entails a considerable amount of duplication of apparatus and stores.

Summary of Samples received during the Year.

Soils collected by Laboratory staff, 277; soils collected by Fields officers, 9; soils, miscellaneous, 15; fertilizers taken under the Fertilizers Act, 7; fertilizers, unofficial samples, 34; fertilizers, miscellaneous, 13; reputed fertilizers and phosphate rocks, 8; limes and limestones, 88; toxicological specimens, 17; wheat, 30; flour, 14; cheese, 49; butter, 2; milk and cream, 84; water, 11; fodder plants, 311; stock-foods, &c., 2; sheep and cattle dips, 214; fungicides, 4; miscellaneous, 87; skim-milk bottles, 390; thermometers, 219: total, 1,885.

Approximate Cost of Paper.—Preparation, not given; printing (800 copies), £50.

By Authority: W. A. G. Skinner, Government Printer, Wellington.—1928.

Price 1s.]

For the Dairy Division analyses of dairy products in connection with the general and special investigation work of the Division, and of cattle-licks, disinfecting and cleaning preparations, &c., have been carried out. The examination of skim-milk bottles used in the purchase of milk and cream under the Dairy Industry Act Regulations, and of dairy thermometers, has been continued, 360 bottles and 219 thermometers having been tested for accuracy during the year.

Further experimental work on the modification of fat content of milk in cheesemaking has been carried out by the Dairy Division in collaboration with this section. A sample of cheese-colouring suspected of containing coal-tar dyes was examined and found to be genuine annatto extract. The question of the possible contamination of cheese by boric acid derived from rennet-extract was inquired into. All the rennet-samples examined contained boric acid, but no trace of this preservative was found in the cheese-samples submitted.

For the Horticulture Division analyses have been made of fungicides and insecticides, honey, honeydew, &c. A sample of reputed poisonous honey, believed to have been gathered from tutu (Coriaria ruscifolia) was examined, but no tutin could be detected. Assistance in the preparation of the Fungicides and Insecticides Act was given.

Officers of the Fields Division have submitted samples of soils, fertilizers, limestones, pastures, &c., for examination and report. Advice and collaboration in chemical matters affecting their work has also been given to officers of all branches of the Department.

Other Work of the Section.

A large amount of consulting-work has been done by the writer and by Mr. T. Rigg, T. Leighton. A statement of the research work of the Laboratory was prepared for presentation at the Imperial Conference of Agricultural Research. At the request of the Council of Scientific and Industrial Research, the writer acted in the committee appointed to deal with applications for the position of [illegible] at the Massey Agricultural College.

[illegible]

The matter of providing adequate accommodation for the work of this Laboratory has again been under consideration. The congestion in the Dominion Laboratory building has been somewhat relieved by the provision of a room in the neighbouring building of the Public Works Department, and further temporary relief will shortly be afforded by the transfer of the soil-analysis work to the building in Fairlie Terrace at present occupied by the Biological Laboratory. The disadvantages as regards effective supervision and co-ordination of work carried on in different parts of the city are, however, obvious, while the arrangement also entails a considerable amount of duplication of apparatus and stores.

Summary of Samples received during the Year.

Soils collected by Laboratory staff, 277; soils collected by Fields officers, 9; soils, miscellaneous, 15; fertilizers taken under the Fertilizers Act, 7; fertilizers, unofficial samples, 94; fertilizers, miscellaneous, 13; reputed fertilizers and phosphate rocks, 8; limes and limestones, 88; toxicological specimens, 12; wheat, 30; flour, 14; cheese, 49; butter, 2; milk and cream, 84; water, 11; fodder plants, 117; stock-foods, &c., 8; dairy and cattle dips, 214; fungicides, 4; miscellaneous, 87; skim-milk bottles, 360; thermometers, 219: total, 1,858.

Approximate Cost of Paper.—Preparation, not given; printing (800 copies), £50.

By Authority: W. A. G. Skinner, Government Printer, Wellington.—1928.

Price [illegible]