

1937.

NEW ZEALAND.

DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT FOR 1936-37.

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

Office of Minister of Agriculture,

Wellington, N.Z., 19th October, 1937.

SIR,—

I have the honour to forward herewith, for Your Excellency's information, the report of the Department of Agriculture for the financial year ended 31st March, 1937.

The report provides a summary of the principal farming activities of the year and outlines the comprehensive and numerous activities of the Department in its work of maintaining and fostering the growth of the rural industries. That work has for its objective the improvement of both the quantity and the quality of the Dominion's agricultural products, and once again the report records achievements in several important directions.

In spite of somewhat adverse seasonal conditions, production has been more than maintained, and the quality of our products continues to attract an increasing number of buyers in available markets. Phenomenal prices have ruled for wool, and the various classes of meat have continued to bring a profitable return for the producer, but the butter-market is still subject to disturbing fluctuations. For the purpose of sheltering the dairy-farmer from the vicissitudes of world prices the Government has inaugurated a system of f.o.b. purchase at fixed prices, and the price for the coming season has been designed to give the farmer of reasonable efficiency a fair standard of living. As yet it is impossible to forecast either volumes or prices during the coming export season, but it will be the objective of the Department of Agriculture by research and educational and instructional work to maintain the reputation which has been won in past years for the products of the Dominion. The farmer's problems are the Department's problems, and by blending science with practice we have made steady progress.

One gratifying feature of the production-year has been the increase in the number of sheep in the Dominion. The total number of sheep in New Zealand on 30th April last was 31,305,818, as against 30,113,704 at the corresponding date last year. This is the highest number ever recorded, the previous record being 30,841,287 in 1930. Particularly significant is the further increase in the number of breeding-ewes. The total on 30th April last was 19,332,077, an advance of 663,116 on the previous year, and the Dominion record. These figures give every reason to expect an increase in the mutton and lamb exports during the coming season.

There has been a slight decrease in the number of dairy cows, but a gratifying rise in the average butterfat returns. The total number of cows in milk and dry in 1936–37 was 1,935,524, as against 1,951,507 for the previous season, while the totals for cows in milk were 1,805,405 and 1,823,358 respectively. The average butterfat returns per cow for the season just ended were 228·56 lb. for cows in milk and dry, as against 217·93 lb. for the previous season. The cows in milk averaged 245·05 lb. last season, as compared with 233·25 lb. for 1935–36.

Year by year pig-raising is becoming an increasingly valuable adjunct to dairying, and to provide for the orderly expansion of the industry the Government has sponsored the setting-up of national and district pig councils, whose duty it will be to provide instructional service in pig-production and safeguard the quality of exports overseas.

The question of live-stock research has become a pressing one in recent years, and, although the health of our animals is good in comparison with other countries, the increases in our flocks and herds consequent upon improved pastures bring in their train problems of disease and nutrition. To meet this situation the Government has agreed to extend the research and instructional activities in connection with live-stock management. The erection of a new laboratory at Wallaceville, costing £15,000, has been authorized, and increases in the staff will be made when suitable men can be secured.

At the beginning of the year the Government purchased Flock House and station from the trustees of the New Zealand Sheep-owners' Acknowledgment of Debt to British Seamen Fund, and is now offering facilities to New Zealand boys to take up farming. The boys taking advantage of this scheme spend a year at Flock House, and then three years' apprenticeship on approved farms. By this means the Government is endeavouring to assist the farmer in obtaining a supply of skilled labour. The Flock House activities are supplementary to the Ruakura Training Farm.

The accompanying statement by the Director-General of Agriculture and the reports of the heads of the various divisions of the Department cover a wide range of subjects which have been dealt with during the past year. The staff of the Department as a whole has done excellent service, of which I record my full appreciation.

I have, &c.,

W. LEE MARTIN,

Minister of Agriculture.

His Excellency the Governor-General.

REPORT OF DIRECTOR-GENERAL.

Wellington, 18th October, 1937.

THE HON. THE MINISTER OF AGRICULTURE,—

Herewith is appended the annual report of the Department describing in detail the various activities carried out during the financial year ended the 31st March, 1937. In the past it has been customary for the Director-General in his annual statement to review certain of these activities, but, as they are all covered in the main report, it is proposed here to outline certain generalizations with regard to New Zealand agriculture and to focus attention on the functions of the Department in relationship to the general agricultural structure.

The farmer's objective is a permanent, comfortable livelihood brought about by his own efforts. When this objective is attained our national economy is buoyant, as the wealth of New Zealand is more closely linked with primary production than is the case in any other country of importance.

Whether the farmer secures a reasonable livelihood or not depends entirely on whether there is a sufficient margin between his outgoings and incomings. Up to the present this margin has been determined by the price he receives for his goods. When prices are high his standard of living can be high, and when prices are low his standard of living must be low. In the past violent movements in prices have been conspicuous, and the farmer's standard of living has had no stability; in fact, he has felt the full impact of these fluctuations perhaps more seriously and more immediately than has any other member of the community.

The philosophy of the present Administration is that the peaks of prosperity and the valleys of adversity should be eliminated by the maintenance of a reasonable price-level which, translated into farmer's terms, means a payable price for his goods, and he would be perfectly prepared to produce permanently at an anchored price-level, provided costs were also anchored.

Where the agriculture of any country is fully developed there are few effective counters to rises in costs whereby equilibrium in farmers' returns may be regained. In such countries rising costs, unless accompanied by rising prices, must depress the farmer's standard of living.

In a country where farming development both nationally and individually is far from complete, where serious leakages often in themselves brought about by development are apparent, the position is very different. New Zealand agriculture is in that position. It is far from full development and has many of the consequent inherent weaknesses. On the other hand, it has the overwhelming advantage of possibilities of greatly increased farm and unit-labour efficiency. These possibilities are easily attainable and tend to offset rises in unit-costs, provided such costs do not take place too rapidly. If rising costs are absorbed in this way the farmer's standard of living is not affected. In New Zealand, therefore, the anchoring of costs is not the only essential whereby the stability of the farmer may be safeguarded. As stressed above, improvement in efficiency of the farm, be it along the line of either quantity or quality, is a factor of equal importance. Such endeavour is likely to be more effective, both nationally and individually, than any anchoring or lowering of the actual costs of goods and services that the farmer has to buy.

The primary function of the Department of Agriculture, by regulation, investigation, and extension, is to guide New Zealand farming along those trends that will bring about an increase in efficiency. It has done much in the past. The field for its future activities is wide, and the possibility of its influence is as incompletely developed as farming itself.

LABOUR-COSTS.

Labour-costs are frequently mentioned as those which must be reduced in order to bridge any gap between costs and returns. Reducing the actual price paid for labour is, however, no solution either individually or nationally. Particularly must this be true in New Zealand with its preponderance of farm-owner labour. The same labour-price, be it to employee or employer, may be cheap or dear, depending on its efficiency. This efficiency is not alone connected with the individual: it is equally connected with the farm, depending on a variety of factors, but particularly on the stage of development that the farm has reached. Labour at the same price may be many times dearer on one farm than on another. This only emphasizes the wide variation in efficiency, or perhaps better development, in all phases of primary production. The gap to be bridged is not so much brought about by the cost of labour, the cost of materials, and the cost of land, but the relative wide variation in the efficiency with which production instruments are used.

The actual efficiency of farm labour itself is important and is linked with adequate training. In this respect New Zealand agriculture is sadly hampered. The adequate training of our farming youth is one of the weakest links in our farming structure. Colleges, training farms, and the like represent no adequate solution. The main body of the future farmers of New Zealand must be properly trained on the farms of New Zealand by farmers themselves. Until this is arranged in some adequate way the first essential towards development on a steadily progressive level will be wanting. The young farmers' club movement being fostered by the Department can play a quite important part, and it is suggested that all farmers should encourage their youthful employees to join such clubs.

MAINTENANCE AND INCREASE IN FERTILITY.

Development is essentially concerned with the maintenance and increase in soil fertility. The intensification of practices bringing this about are therefore of prime importance. The steady drain of fertility, represented by the export of goods from the farm, more intense with crops than with live-stock, must be made good with fertility management if advancement and not retrogression is to take place. The full exploitation of fertilizers, a proper balance between clovers and grasses, a proper balance between cattle and sheep, better crop rotation in the arable districts, and irrigation in districts of low rainfall are the main factors in fertility maintenance and increase. Of these practices perhaps the most important is that of top-dressing with artificial fertilizers, one that is, fortunately, steadily on the increase. It is significant that the top-dressing districts of New Zealand show the most striking progress, whereas those where fertilizers are little used or where it is not practicable to apply them are on the decline rather than the rise. In this respect there are great areas of mountainous tussock country steadily declining in carrying-capacity, and wide areas of high rainfall country, originally in forest and now unploughable, where nature rather than the farmer has control of future development. These two types of country, aggregating as they do nearly 16,000,000 acres, or nearly half the area devoted to production, represent the most serious agricultural problem in New Zealand, as any rise in production costs on them or any depression in prices brings them within the sub-marginal range. A certain amount of research on fertility management of these areas has been carried out during recent years, but it is essential that such work should be steadily prosecuted in the hope that practical methods may be evolved to arrest the steady deterioration now taking place.

THE USE OF INFERIOR BREEDING-STOCK.

An important factor in the quality and quantity of production and in the raising of farming-costs is that of inferior breeding-stock. Whether or not regulatory action to improve the position would be advantageous, as has been adopted in certain countries, is worthy of the closest investigation. The remedy generally advocated is stock-importation, and this no doubt is essential in a number of directions. More important, however, is a proper genetical study of the various breeding-strains already in the country, and from it the standardization of type leading towards the elimination of inferiority and the development of superiority. Up to the present the Department of Agriculture has played little part in developing methods of stock-improvement as it has in the development of many other farm practices, and until it is properly equipped in this respect its full function as the national guiding agent in progressive agricultural development cannot be realized.

ANIMAL HEALTH.

It is customary to congratulate ourselves on the absence of many serious animal-diseases rife in many other stock-producing countries. This, however, does not mean the leakage and consequent increased cost of production brought about by animal-disease is not serious. The position is far from satisfactory, and intensification of production brings in its train an intensification of the problem. Many of our most serious diseases are intimately connected with degrees in the plane of nutrition. Our grassland management and research has been more from the agronomic than the veterinary angle, and at present is quite unbalanced. Proper orientation from both angles is essential, but this will come about only by extensive research in problems now almost unexplored. On the one hand stock losses each year are costing us some millions of pounds, while on the other hand research aimed at their avoidance runs into a thousand or so annually. It is urgent that this position be rectified. In the dairy industry alone a reduction in the replacement of stock

lost through disease to a satisfactorily low percentage would reduce dairying costs, or, rather, raise labour-unit efficiency to a point where fertilizer-costs, the main maintenance expenditure of the dairy-farmer, could be offset. In sheep-farming, also, if the vitality of young and breeding stock were brought to a satisfactory point, farming-costs would be appreciably reduced. The maintenance of animal health is so vitally concerned with reduction in costs of our two great primary industries that the means to an end—namely, research into all phases of diseases under conditions existent in New Zealand—should be vigorously prosecuted by the best brains procurable. The Department has already moved in this direction by improving the research facilities at Wallaceville, and the action of the Dairy Board in being prepared to subsidize extensively research into cow diseases should enable real progress to take place.

AVERAGE EFFICIENCY.

The average efficiency of our farming is being seriously lowered by the percentage of low efficiency farms involving high unit-production costs brought about by a variety of circumstances, such as low stage of development, insufficient working capital, and non-standardization of farming methods. The non-standardization of farming method, with its variants and modifications that must exist, dependent on soil, climate, topography, size, transport, and marketing, represents one of the main reasons for our very wide divergence of efficiency. Non-standardization is largely due to the lack of endeavour that has been devoted in the past to a real study of what should constitute scientific farming under our conditions or, better, what are the factors that must be directed and controlled whereby high efficiency is realizable.

High farming efficiency in most cases results in high production efficiency per unit of labour employed, and this combination is the essential in lessening production-costs. The raising of the average to a higher level than at present will therefore tend to stabilize the farmer and thereby stabilize the Dominion economy. Standards representing real efficiency are urgently required to be defined and attained throughout the whole range of agricultural products. The Department has already efficiency standards in dairy production, and dairy-farming progress has been largely influenced by these standards being used as regular measuring-rods that the dairy-farmer applies to check up his practices.

REGULATIONS.

In the earlier stages of the history of the Department regulatory measures were invoked to protect others from the consequences of the inefficient farmer or to protect the inefficient farmer himself.

Agricultural legislation, however, may be directed either to the products of farming or to the processes of production. The first has in most cases reference to the quality or type of product, and the other to what the farmer should or should not do in the production of his goods. Agricultural legislation directly relating to products can be viewed in general as of great value, inasmuch as it can be made generally applicable, and can be satisfactorily and successfully administered. Enactments compelling the farmer to observe regulations at the production end often fail to achieve their objective, due largely to their having been enacted in advance of the standardization of farming method that would enable such legislation to function satisfactorily. The most notable example on our statute-book is the Noxious Weeds Act.

An intensification of regulation governing farm products would appear to be desirable, leading to standardization at a high level, and at the same time the development of standardization at as high a level as possible of the products the farmer buys, such as stock, seeds, fertilizers, and labour. On the other hand, regulation of what the farmer should or should not do in the actual production of his goods should be avoided until such time as the real standards of farm-management are accurately determined by organized research. There is, however, already available a large store of knowledge on the problem of farming efficiency, and it should be one of the main objectives of the Department, by intensive extension work, generally to promulgate better farming methods in every direction where they can be applied. At the production end the objective must be educational. Steady improvement can be brought about by the amassing and dissemination of knowledge based on accurate farm-management study, rather than by regulation, and the administration of the Department of Agriculture is gradually being moulded along these lines.

A. H. COCKAYNE, Director-General.

LIVE-STOCK DIVISION.

REPORT OF W. C. BARRY, M.R.C.V.S., DIRECTOR.

The year just closed has been a particularly arduous one for this Division of the Department, attributable largely to the increasing animal population of the Dominion, the rapid expansion of the swine industry, and the more intensive efforts for the suppression of ragwort. Thus, obviously, officers have had their activities increased in the field, laboratory, meat-export works, and at headquarters.

The satisfactory position as regards animal-diseases is being maintained, and the Dominion is still free from the more serious diseases. It is recognized, however, that the present ailments of stock, particularly of dairy cattle, call for still more intensive investigation, and the intention is to increase the staff of veterinary research officers as soon as suitable officers can be secured.

HEALTH OF LIVE-STOCK.

HORSES.

The position in regard to the contagious diseases of horses is a very satisfactory one. With the exception of the occurrence of some cases of strangles, no contagious disease of horses is reported. About forty horses were affected with this disease in one outbreak, but no deaths occurred.

The breeding of draught horses, mainly of the Clydesdale breed, continues to be a feature of farm-stock production in the South Island, principally in the Otago, Southland, and Canterbury districts. The introduction of a number of stallions of the desired type has stimulated the breeding of this class of horse in some of the North Island districts. It is a fact, however, that a tendency to discard teams and replace them with tractors may give breeders a setback in that the prospective demand may not be sustained. Good prices have been obtained for draught horses throughout the year, the export of breeding stock to Australia being of considerable importance to the Dominion.

The breeding of horses suitable for remount purposes is much neglected. Of the lighter class of horses the presence of hunt clubs in several districts tends to encourage the breeding of hunters and hacks. Some encouragement would appear to be necessary before any marked improvement in the breeding of horses suitable for remount purposes can be expected.

CATTLE.

Tuberculosis.—In the administration of the Stock Act, 7,706 cattle were condemned on clinical grounds or as a result of the application of the tuberculin test, compensation being paid in accordance with the provisions of the Act. The total number of cattle, exclusive of calves, examined at the various abattoirs and meat-export slaughter-houses was 417,706, a decrease of 61,257 on last year's figures. Of these, 28,427, or 6.805 per cent., were found to be affected with tuberculosis in varying degrees, a large percentage being only slightly affected. During the year the tuberculin test was applied to 20,577 cattle, of which number 970 reacted, 4.7 per cent.

Actinomycosis.—The number of animals condemned for this disease and for which compensation was paid totalled 972. The Department continues to supply, through its various offices, the farming community with potassium-iodide tablets for the treatment and cure of suitable cases, and many cured animals continue to produce.

Malignant Growths.—The number of animals condemned and for which compensation was paid was 427.

Blackleg.—The position in regard to the control of this disease remains satisfactory. A small increase in the number of outbreaks occurred in the Auckland district, but the disease did not appear in new territory. The total number of calves vaccinated in the blackleg areas of Taranaki and Auckland during the year was 28,969. This figure shows a considerable increase in the vaccinations as compared with last year's figures, the increase taking place in both districts. The increase in the period following vaccination, when calves may be removed from an affected area, is much appreciated by the farming community and by the officers carrying out this work.

Anthrax.—The freedom of the Dominion from this disease is pleasing to record.

John's Disease.—The evidence accumulated throughout the year shows that this chronic disease of cattle is being reported on several fresh farms from time to time. In the Waikato the disease was confirmed on seven fresh farms during the year, and in Taranaki the disease was shown to exist on ten further farms. Although on many of these farms the actual number of cattle affected with the disease is small the increase in the number of farms affected, together with the difficulty of knowing the exact extent of the disease in any one district, makes the problem of control of the disease a serious matter. The chronic nature of the disease, with the long period of incubation before clinical symptoms are shown, is a feature of the disease which handicaps the most enthusiastic worker in any survey as to the exact incidence in any district.

In the control of the disease the Johnin test is being availed of by veterinarians in the Taranaki and Waikato districts. In the Waikato district this work is being carried out by Mr. Marshall, assisted by Mr. McDonald. In the Taranaki district Mr. Stephens, Stratford, carried out the intradermal Johnin-testing. The South Taranaki district work in connection with Johnin-testing is now being carried out by Mr. Alexander, Hawera. The slow and exacting nature of this work being carried out and recorded reflects credit on the officers concerned.

A semi-annual Johnin test is being applied to a number of herds, and reactors are being slaughtered. It is hoped in this way to eventually eradicate the disease from such herds. The draining or fencing of swampy areas and subsequent heavy dressing with lime are measures adopted with a view to eradication of the infection from contaminated farms. A series of semi-annual tests must be applied, and some time must elapse before any definite statement can be made.

In order to prevent the spread of the disease it is now necessary to have all dairy cattle intended for shipment to the South Island tested by the double intradermal Johnin test prior to shipment. Although a limited amount of testing in this connection has been done, it is gratifying to know that so far no reactors have been found. This is evidence that the disease is confined to definite areas.

Mammitis.—The position in regard to mammitis during the year would appear to be less satisfactory. The larger number of cases in many districts can be attributed to the very variable season with the higher rainfall in the spring and throughout the summer. Under such seasonal conditions the sanitation measures necessary in and about many milking-sheds cannot be maintained, and an increasing number of cows show mammitis as a consequence. In wet seasons there is an increase in the number of cows affected with pox on the udder and general abrasion of the teats, resulting in more cases of mammitis. A high standard of hygiene in the shed is difficult to attain in such a season.

The facilities provided by the Wallaceville and Hamilton laboratories in the examination of milk-samples for farmers are still being availed of and are much appreciated by owners desirous of a means of control. The mammitis-control scheme of the laboratory should be taken more advantage of by farmers as the value of hygienic measures in prevention cannot be given too much importance.

Contagious Abortion.—This disease of cattle is in the same position as in former years. It would appear that a reduction in the number of outbreaks as compared with the previous season is to be recorded. The control of the disease must be based on hygienic measures adopted in the management of the dairy herd, the isolation of affected animals, and the furtherance of the principle of self-maintenance in regard to replacements in dairy herds.

The testing of blood-samples by the application of the agglutination test is of considerable importance to the owner of the herd and also to the officer who is investigating the disease on affected farms. The control measures to be adopted depend largely upon the result of the blood test showing the extent of the disease in any herd.

Temporary Sterility.—This trouble has been on a level with previous years. The investigations in regard to the several aspects of the aetiology of the condition of delayed conception in dairy herds are being continued. There is no doubt that delayed conception, as a breeding problem for the farmer, is not due to any specific cause, the female factor, the male factor, the disease factor, and the nutritional aspect all requiring to be further investigated. After investigation of the history of the trouble on many farms at the present time suitable remedial measures can be suggested.

Cattle-tick.—The cattle-tick parasite was reported during the year to be present in some districts not previously infected or on farms where eradication measures had previously been adopted. It is difficult to understand the importance which is attached to this parasite in the light of present knowledge. The control measures of dipping and spraying affected stock and the burning of roughage so as to destroy the cover for the tick are effective measures so far as they apply, but it is a very difficult matter to control such disseminating agents as birds, hares, &c.

Many owners in affected areas are now inclined to treat the presence of tick as of no consequence. Climatic conditions are, no doubt, a major factor in the limitation of the spread of this parasite.

Grass Staggers in Cows (Grass Tetany).—The cases of this disease which occur in dairy cows after calving have been seen in the Auckland district, mainly in the Waikato territory. Two cases are reported from the Wanganui district. The use of magnesium sulphate as a hypodermic injection to affected animals has given good results in a great many cases. Dolomite was used on fourteen farms as a preventive, and the results are generally favourable, reports Mr. Collins, District Superintendent, Auckland.

Tympanitis (Bloat) in Cattle.—This condition did not cause any serious trouble during the year. It is remarkable that it has not been reported to the same extent as in previous years. A significant inference which might be drawn from this fact is that the incidence of the trouble was considerably lessened by the particularly wet spring and summer when the feed was remarkably soft and of a laxative nature. Much scouring took place in dairy herds during the spring and summer owing to feed conditions, and the production was not as high as expected on this account.

"Foul Foot" in Cattle.—This condition, as was to be expected, was prevalent on many farms throughout the year. Farmers who had no trouble in previous years were confronted with the disease during the past season. The climatic conditions favouring muddy surroundings in and about the yards and paddocks are undoubtedly the cause of the increase in the number of cases. The use of a concrete walk-out from the shed and the more general use of concrete to control the muddy conditions associated with the movement of dairy herds will lessen the incidence of foot-troubles. Much advice in regard to the treatment of affected animals and also in regard to the prevention of the condition has been given by field officers.

Ergotism and "Fescue Poisoning."—In districts where tall fescue is liable to become a rank growth and allowed to form seed heads there is always the danger of animals being affected with ergotism when the farmers use such growth for stock during the winter months of scarcity. There is not the same danger when the fescue growth has been controlled by suitable grazing throughout the season.

Parasitic Disease in Young Cattle.—Parasitic gastro-enteritis and bronchitis still continue to be a problem for the producer who raises young stock. Many calves on dairy-farms are lost annually from this disease, and many more are of weak constitution following a severe attack of worms. In many cases weaning takes place too soon or supplementary feed is not supplied to make up for the deterioration in the feeding-value of pasture during the autumn and winter. Better-developed

calves with stronger constitutions would result from a more prolonged feeding with milk or other reasonable substitute, and in the rearing of good calves better feeding is the basis of success. The production of stronger, better-constituted yearlings would improve the disease position generally in many herds in the course of a few years.

SHEEP.

A very satisfactory year has been experienced by the sheep-farmer in the matter of prices for wool, lambs, and fat sheep generally. Wool commanded very good prices throughout the season, and this, no doubt, largely influenced the good returns from lamb and mutton. From a production point of view, the season commenced well with an improved lambing percentage, but, unfortunately, the wet spring and summer made it difficult to fatten and finish the lambs as early as usual. Although the lambs grew well they lacked finish early and many "seconds" were seen at the freezing-works in the early part of the season. In some districts an improvement took place later and the high prices ruling have resulted in a marked increase in the killing of sheep and lambs for export. Increased slaughtering figures are given for many works as compared with the previous season.

At the same time there is a considerable carry-over of hoggets in poor condition and heavily infested with parasites. This is very general this year on account of the heavy rainfall and luxuriant growth of unsuitable feed for sheep, factors which favour parasitic propagation and infestation of stock.

Some considerable loss of sheep from pneumonia in Otago and Southland was under investigation during the year, but generally no serious outbreak of sheep disease has occurred during the year.

Photo-sensitization (Facial Eczema).—No major trouble was experienced during the year due to this condition. The climatic and feed conditions did not favour the onset of this disease. In the Gisborne district a small number of sheep were affected to a slight extent, as evidenced by the condition of some livers examined when stock in this district was slaughtered. During the months of January and February inquiries were made in regard to the condition in the Poverty Bay district.

No cases of the disease came under notice in the Mackenzie Country or in Otago Central, although species of hypericum were seen in both districts.

Parasitic Disease.—The control of parasitic disease in sheep during the past season has again proved to be very necessary if heavy losses are to be avoided. The unseasonable feed conditions for sheep throughout have made it difficult to carry over hoggets with any degree of immunity from loss. Hogget feeding and wintering is a more or less specialized branch of sheep-farming and unless farmers give special thought and attention to it the results are at times very discouraging. The provision of supplementary feeding in the way of hay, roots, ensilage (and in some cases oats and peas are available) reduces the risk of loss to a very marked extent. It is necessary also to provide a balanced ration wherever possible, as too much watery feed such as roots alone prove of doubtful value. Too much emphasis is often placed on the use of drenches of worm preparations without due attention to the feed conditions. In other cases, although the feed conditions are reasonable, drenching is totally neglected or left until the hoggets become weak and scouring takes place. The instructions given by field officers to drench early and repeat at intervals with a reliable drench such as the copper sulphate-nicotine mixture, and attention to the feed conditions are most satisfactory, and where carried out give very satisfactory results. It is pleasing to record that this drench is being quite generally used in the eradication of worms from infested stock.

Infectious Enterotoxaemia of Lambs (Pulpy Kidney).—Reports indicate that in the Otago district the losses from this disease were generally below the average of the last two years. In a few instances, however, lambs of an older age were affected with the disease, and this also applied to some losses recorded in the Nelson district.

An extension of the vaccination of the pregnant ewe with a view to conferring immunity on the lambs through the colostrum was organized and carried out by Mr. Dayus, District Superintendent, Dunedin. Mr. Dayus reports: "In all, 2,608 ewes were vaccinated with a vaccine prepared at the Wallaceville Veterinary Laboratory. In addition, observations were maintained on a group of 1,141 ewes, which were vaccinated by farmers, in some cases without help, with a commercial enterotoxaemia vaccine purchased from the Commonwealth Serum Laboratories, Royal Park, Victoria. In all cases a suitable number of control ewes were reserved, which, with the vaccinated ewes, were depastured together. The results briefly show that in the group of 2,608 vaccinated ewes the losses of lambs from pulpy-kidney disease were eight, whereas in the control group of 2,500 unvaccinated ewes the losses totalled eighty-four, or in other words the losses of lambs from vaccinated ewes were 0.306 per cent., whereas the loss of lambs from the control unvaccinated ewes was 3.36 per cent. In the second trial, using the commercial vaccine, the losses of lambs from 1,141 vaccinated ewes were 22, or 1.92 per cent., whereas the losses of lambs from 2,275 control ewes were 84, or 3.68 per cent."

Lymphadenitis.—Although the incidence of this disease in sheep is not so high in New Zealand as in some other countries, it is, nevertheless, a disease which, from a carcass and meat inspection point of view, requires to be kept in check to enable the export of these products to be carried out without any undue restrictions. It has been clearly demonstrated that the regular annual palpation of live sheep will detect affected animals and a continuance of this practice on infected properties over a few years leads to a marked reduction of the disease in infected flocks. Furthermore, the precautions, previously outlined, at shearing-time should be more seriously adopted by farmers in order to reduce the incidence of the disease in the carcass to a minimum. The chronic nature of the disease which allows it to remain undetected in many cases until the carcass is examined for export may account for a lack of interest. Affected carcasses are rejected for export.

Mycotic Dermatitis.—One case of this disease was recorded from Canterbury, the badly affected pelt being forwarded to the Wallaceville Laboratory.

Pregnancy Toxæmia of Ewes.—There was no increase in the incidence of this trouble during the year. In many cases the deaths followed a shortage or check in the feed-supply of the pregnant ewes, and the cases were more numerous after severe weather conditions, heavy frosts, or snow. In a rather severe outbreak in the North Island following several severe frosts, the mortality ceased with the additional feed provided, combined with a few days' regular slow exercise.

Contagious Ecthyma (Sore Mouth).—Some vaccination in regard to the prevention of this condition in lambs has been tried, and so far the results are encouraging. No cases have been seen in the lambs previously vaccinated.

Sheep Blow-fly.—A preliminary survey with a view to more intensive research work in regard to this pest has been carried out during the year. Further work will be executed during the coming year with the increased staff now available.

Liver-fluke.—The presence of this parasite is mainly confined to the Hawke's Bay district, where its association in the causation of black disease has been previously recorded. It was also found on another farm in the Auckland district, where control measures are being taken.

Foot-rot.—There has been an increase in this disease of sheep in some districts. The feed conditions and wet season favour an increase in the number of sheep affected.

Lice and Ticks.—The previously recorded system of inspection of flocks inaugurated in the Poverty Bay district has continued to give good results and has reduced the prevalence of lice-infested sheep exposed for sale. More care in dipping is being exercised, and more interest is being taken by the farmer.

The number of prosecutions for exposing lice-infested sheep for sale during the year shows clearly that much improvement is still desirable. There may be some excuse for men with small lots of sheep and no dipping facilities, but, generally speaking, the offenders are not confined to this class alone.

PIGS.

The number of pigs slaughtered for the season 1936–37 at registered premises was 1,062,510. Those slaughtered on holdings and examined at butchers' shops numbered 25,488, making a total of 1,087,998 carcasses, an increase of 63,008 over last year's figures. In addition, approximately 20,000 pigs are slaughtered annually on farms and consumed thereon, bringing the total estimated slaughterings to approximately 1,107,998. Of 1,060,835 carcasses coming under direct inspection, 194,517 carcasses were found to be affected in varying degrees with tuberculosis, the percentage infection being 18·33 per cent. (the majority of these showing only slight head lesions).

The year's killings of pigs (minus those referred to for farm consumption) are as follows: Meat-export works, 807,041; abattoirs, 170,063; bacon-factories, 58,243; ordinary slaughter houses, 27,163; shops, 25,488; total, 1,087,998.

Pasteurellosis and Suipestifer Infection.—These infections are responsible for a large number of the deaths in young pigs after the weaning-stage, where the major lesions are either pleurisy and pneumonia or enteritis, or occasionally the infection is of a septicæmic nature. The experience of field officers in dealing with the above infections undoubtedly shows that much of the mortality in pigs from these causes can be prevented by improved methods of swine husbandry, with special reference to better feeding and housing and better sanitation and hygiene of pig houses and runs.

Sarcoptic Mange.—This disease of pigs has been well under control during the year, no outbreaks being recorded. The practice of dressing pigs with oil to eradicate lice is a factor also in the control of sarcoptic mange.

Necrotic Ulceration of the Skin.—This condition still remains on too many pigs sent forward for slaughter and is the cause of rejection of many carcasses. Where the standard of swine husbandry on a farm is reasonably good, no cases are seen, so that improved hygienic measures would eradicate the condition from many farms.

Owing to the greatly increased interest in pig-keeping and the growing importance of this aspect of farm economy, Mr. M. J. Scott, M.A., B.Sc., of Lincoln Agricultural College, was appointed to the position of Superintendent of the Pig Industry in order to organize and co-ordinate the various activities necessary for swine husbandry along sound lines. Mr. Scott has submitted a report as under:—

“The development that has taken place in the pig industry during the last ten years is displayed by the following figures:—

Year.	Number of Sows.	Total Pigs killed.	As Baconers.	As Porkers.
1927	69,487	380,954	268,075	112,879
1928	83,103	476,828	237,960	238,868
1929	74,692	518,025	247,292	270,733
1930	61,706	515,428	255,758	259,670
1931	64,981	525,286	212,206	313,080
1932	75,409	474,094	207,096	266,998
1933	87,686	635,282	243,820	391,462
1934	98,299	784,952	313,135	471,817
1935	111,793	936,700	346,948	589,752
1936	116,058	1,077,883	427,178	650,705

" This table displays more strikingly than it can be said in words the increase that is continuing to take place in the industry. A little calculation shows that pigs killed per sow have increased from about $5\frac{1}{2}$ in 1927 to just over 9 in 1936. This represents an increase in efficiency of sow-management of close on 100 per cent. The gradual change over from bacon to pork and back again in the last two years to bacon-production is also shown in this table. While our porkers have acquired a reputation for excellence on the English market that makes them wholly acceptable, our baconers are not so favourably received. Those interested in the industry realizing the difficulties ahead, and anxious for the welfare of a rapidly-developing bacon export trade, have been anxious to establish an improved national pig service in the Department, and as a result a number of developments have taken place, as follows :—

" National Sow Recording : In response to frequent requests from the New Zealand Pig-breeders' Association and other interested organizations a national system of sow recording was instituted in December of last year. Under this scheme the Department undertakes, through its Stock Inspectors, to weigh the litters of any pedigree sow at three weeks and again at eight weeks. The owner then receives a copy of his sow's record after the details of breeding and mating have been checked by the Pig-breeders' Association. This service is an initial step in the selection of the better strains of breeding stock, a goal that will be attainable only when there are established a number of testing stations where the ability to grow with a minimum of feed, plus the ability to produce a carcass of suitable quality, could be ascertained.

" National Instructional Service : As from the 1st May Cabinet has given its approval for the application of a levy of 2d. per pig on every pig killed for the purpose of establishing a national instructional service for pigs. The organization for the administration of this levy is at present under consideration. It is hoped to establish a National Pig Council, representative of every section of the industry, whose business will be to determine the national policy and allocate the expenditure of this levy. An instructional service in both the Waikato and Manawatu districts controlled by the pig-recording clubs has achieved excellent results in both these places, and it is hoped that on a Dominion-wide basis similar results will be obtained. The specialized quality of both pork and bacon pigs calls for the active dissemination of all available information in order to have the right type of pig produced. By this same means there should be a tendency to improve the conditions under which pigs are kept, and so to remove the major causes of rejection and degrading that are now the chief source of losses in the industry.

" Grading of Pigs : It has been felt for a long time that a similarity of price for pigs of both high and low quality has been discouraging to the producer of high-quality pigs and inimical to the best interests of the industry. In an attempt to introduce some improvement in the present grading of pigs a meeting of those interested was convened, and from this meeting a committee of ten was appointed. Their findings will be given careful consideration with the object of ultimately devising a plan that can be put into operation with a minimum of upset to an already well-established trade. The introduction of stricter grading at this stage may have repercussion on producers, exporters, and in the industry in general that would never have eventuated had grading been in operation from the beginning, and it is of considerable importance that a minimum of disturbances should be caused at this stage. It will be only by the whole-hearted and active co-operation of all interests that successful grading will ultimately eventuate."

DAIRY INSPECTION.

In the safeguarding of public health through its milk-supply an important feature is the inspection by this Division of herds and dairies supplying milk for household use. During the past year, in co-operation with the Department of Health, special attention has been given to the recently-instituted scheme of milk for schools, ensuring that the milk for scholars is obtained only from approved premises.

In the Dominion there are approximately five thousand dairies registered for the supply of raw milk. These are under strict supervision as regards sanitary conditions, and all the equipment is inspected periodically to see that it is maintained in a clean state, while, in addition, the herds themselves come under observation for inspection for disease.

Many structural improvements have been carried out during the year, and a number of new sheds have been erected. Substantial improvement is noted in dairy premises generally.

LIVE-STOCK STATISTICS.

The 1936 sheep returns, collected as at the 30th April, showed that sheep flocks in the Dominion increased by 1,036,950 to a total of 30,113,704. An increase of 856,544 occurred in the number of breeding ewes. The number of sheepowners has increased by 352 to a total of 30,590. The number of cattle in the Dominion as at the 31st January, 1936, decreased by 39,421 to 4,254,078. The number of dairy cows within the total shown decreased by 1,587 to a total of 1,951,507. The number of pigs in the Dominion as revealed in the 1936 enumeration was 808,463, being an increase of 45,708 on the previous year's figures. Horses show an increase of 3,184 to a total of 276,170.

SLAUGHTER OF STOCK.

The total numbers of stock slaughtered at registered premises were : Sheep, 2,901,315 ; lambs, 9,294,722 ; cattle, 506,141 ; calves, 1,045,827 ; swine, 1,062,510.

The following table shows the stock slaughtered during the past year at freezing-works only, the previous year's figures being shown for comparison :—

Stock.				Year ended 31st March, 1937.	Year ended 31st March, 1936.	Increase.	Decrease.
Cattle	..	..	..	244,834	305,868	..	61,034
Calves	..	..	..	957,141	986,145	..	29,004
Sheep	..	..	..	2,121,925	1,882,446	239,479	..
Lambs	..	..	..	9,180,482	8,564,482	616,000	..
Swine	..	..	..	807,041	768,976	38,065	..

For further purposes of comparison the following table is given, showing 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 slaughtering from the beginning of each season to 31st March :—

Stock.				1933-34.	1934-35.	1935-36.	1936-37.
Sheep	..	..	..	1,293,617	1,735,237	1,287,331	1,276,234
Lambs	..	..	..	6,030,575	6,626,315	6,269,694	6,536,408

These figures show a decrease of 11,097 sheep and an increase of 266,714 lambs compared with the same period last year.

Following are the numbers of each class of animal slaughtered under direct inspection during the year ended 31st March, 1936 : Cattle, 417,706 ; calves, 1,043,855 ; sheep, 2,687,518 ; lambs, 9,274,839 ; swine, 1,035,347.

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

Stock.				Abattoirs.	Meat-export Slaughterhouses.	Bacon Factories.
Cattle	..	..	..	172,872	244,834	..
Calves	..	..	..	86,714	957,141	..
Sheep	..	..	..	565,593	2,121,925	..
Lambs	..	..	..	94,357	9,180,482	..
Swine	..	..	..	170,063	807,041	58,243

Stock slaughtered at ordinary slaughterhouses during the year ended 31st March, 1935, was as follows : Cattle, 88,435 ; calves, 1,972 ; sheep, 213,797 ; lambs, 19,883 ; swine, 27,163. Carcasses of pork killed and dressed by farmers, sent into butchers' shops and small factories, and examined by Departmental officers, numbered 25,488.

In connection with the animals shown in the above tables as slaughtered at meat-export slaughterhouses, the following numbers are returned as having gone into consumption within the Dominion : Cattle, 34,754 ; calves, 99,772 ; sheep, 187,810 ; lambs, 91,300 ; swine, 139,894.

COMPENSATION PAID FOR STOCK AND MEAT CONDEMNED.

Compensation to the amount of £12,944 was paid out during the year for animals condemned in the field for disease under the provisions of the Stock Act, and £26,281 for carcasses, or parts of carcasses, condemned for disease on examination at the time of slaughter at abattoirs, meat-export slaughterhouses, &c., under the provisions of the Slaughtering and Inspection Act.

IMPORTATION OF STOCK.

The following stock was imported during the year : Cattle, 40 ; sheep, 414 ; pigs, 5 ; horses, 24 (draught). Of the above animals, the following were placed in quarantine for the respective periods required : Cattle, 41 ; sheep, 7 ; pigs, 5.

EXPORTATION OF STOCK.

During the year under review the following animals were exported : Sheep, 6,113 ; cattle, 15 ; pigs, 52 ; horses, 22 (draught).

There was the usual movement of thoroughbred horses to and from Australia.

POULTRY.

The poultry industry of the Dominion is one that presents very great difficulties in the attempts at bringing about a better system of organization, as in spite of the activities of the Poultry Board and the Producers' Federation, which it set up, the progress has not been as satisfactory as one would wish. Throughout the year the health of flocks has generally been good, but several instances of coccidiosis, especially in the North Island, came under notice.

The following is the report of Mr. C. J. C. Cussen, Chief Poultry Instructor :—

“While it cannot be claimed that a great deal of advancement has been made during the year, it would appear that the industry is gradually settling down to a more solid basis and that the true possibilities and real needs of the industry are becoming better known.

“The production of eggs and table poultry is an important branch of agriculture that warrants encouragement, and the assistance that is being given by the Government to those engaged in the production of these essential and valuable articles of food is fully justified. However, it may be advisable to remind those who may think of taking up the business as a means of livelihood that poultry-keeping on a large scale is a highly specialized business that should not be undertaken without first gaining some practical experience, if possible, on a successful poultry-keeper's plant, that there is a limit to the quantity of eggs that can be profitably marketed in this country, and that the prospects of building up a large profitable egg-export are not encouraging.

“It is not desired to infer that the industry has reached the limit of its profitable expansion in this Dominion, for when it is considered that in Canada since the introduction of a system of egg-grading for local marketing, controlled and supervised by the Government, the average consumption per head of the population has increased from 202 to over 400 eggs per annum, it would appear that there is ample room for improving our industry by a better system of local marketing.

“*Census of Poultry, 1936.*—A census of poultry was associated with the census of population taken for the 24th March, 1936, and the following is the principal result, including fowls, ducks, geese, and turkeys: North Island, 2,316,058; South Island, 1,703,018: total, 4,019,076. The proportion of poultry to population is higher in the South Island than in the North Island by about one-third.

“Movement in the number of poultry over the last three censuses, including Maori flocks, has been :—

Census.	Fowls.	Ducks.	Geese.	Turkeys.	Total.
1921	3,491,567	379,988	46,234	73,220	3,991,009
1926	3,308,384	352,030	43,879	76,825	3,781,145
1936	3,415,793	351,608	61,418	82,896	3,911,715

“The average number of birds per head of population has been as follows, Maori flocks not included: 1921, 3.3; 1926, 2.8; 1936, 2.6. The number of householders maintaining poultry numbered 166,354, an increase of only 242 on the 1926 figure. The size of the average flock is some 23.3 birds. The great majority of flocks are small, 81 per cent. of the total containing less than twenty-five birds. While the figures show a fall in the proportion of poultry-keeping householders to total householders, the returns also show that there were 504 flocks of 500 birds and over, as compared with 214 flocks of 500 birds and over in 1926, which would indicate that a larger number of poultry-keepers are specializing in the business and depending upon their poultry as a means of a good deal of their livelihood.

“*Export.*—During the past season some 11,281 cases—338,430 dozen—eggs were shipped to the United Kingdom, as compared with 11,915 cases—357,450 dozen—shipped the previous season. This shows a decrease of 19,020 dozen over the previous season's export.

“It is regrettable to have to report that owing to the low price of eggs on the London market, and the fact that a number of the eggs shipped from Christchurch reached the market in a poor condition, the export was not a financial success as far as Christchurch and Otago provinces were concerned. Investigations are still being made, but up to the present it is difficult to account for the eggs arriving in poor condition.

“It may be mentioned that though Christchurch is the largest egg-exporting centre in the Dominion the facilities for the grading, packing, and holding of eggs before shipping are inadequate, and the matter of providing better facilities for this work needs serious consideration if the export business is to be successfully continued from Christchurch.

“*Chick-sexing Examinations.*—Examinations were conducted by the Department at Wallaceville and at Christchurch at the end of August. In all, eight students undertook the examination, and two were successful. One qualified for a second-class certificate, and one who held a second-class certificate qualified to have his certificate renewed. If there are sufficient candidates offering the Department is prepared to undertake further examinations at the beginning of this hatching-season.

“*Disease.*—Intestinal coccidiosis caused some heavy losses in various parts of the Dominion during last year, especially in the Wellington, Foxton, and Manawatu districts. In order to protect the industry against the spread of the disease it was found necessary to place restrictions on the sale of stock from four large plants. Extra service was rendered by the instructional staff to owners of these plants, and by a general cleaning-up of the plants, heavy culling of stock, and special care in the selection of breeding birds it is pleasing to be able to report that conditions have so much improved that the restrictions imposed have now been removed from three of the plants concerned.

“Poultry-keepers cannot be too careful to guard against disease, and the best preventive measures to employ are extra care in the selection of breeding-stock, rearing the birds on fresh ground, avoiding overcrowding, and keeping houses as clean and dry as possible.

“*Wallaceville Poultry Station.*—This plant continues to render good service to the industry. The quality of the stock is being maintained, and the introduction of the fresh blood from New South Wales is proving beneficial. The demand for eggs for hatching-purposes, and breeding-birds, by both

large and small poultry-keepers is on the increase. Five feeding-tests with some two hundred adult pullets were carried out during the year, and five similar tests with a different lot of birds are being carried out this year. The result of these tests should prove of interest and value to poultry-keepers.

“*Chilled Eggs (Marketing) Regulations.*—Visits of inspection to the various cool-stores showed that those concerned have complied with the regulations. Less eggs were cool-stored during last flush season, owing, it is said, to the fact that some difficulty was experienced last season in selling eggs marked ‘chilled.’

“In order to avoid trouble by persons who may be inclined to evade the regulations, I would recommend that the regulations be amended so as to provide for the stamping of all cool-stored eggs.

“*Egg-laying Tests.*—The four laying-tests at Auckland, Taranaki, Massey College, and Christchurch were again well supported. The birds and eggs were judged three times during the year by the Department’s Poultry Instructors, and, generally speaking, the birds were found to be up to standard, while those competing at Christchurch were a little better than usual.

“Three Khaki Campbell ducks did well at Christchurch in laying 935 eggs in fifty-one weeks, and six White Leghorns in laying 1,500 standard weight eggs in fifty-one weeks.

“At the Auckland test one Khaki Campbell duck produced a standard weight egg on each day of the fifty weeks of the test, while a second duck only missed two days during the same period.

“*Instructional Staff.*—The reports of the three instructional officers show that, in addition to other duties, some 1,398 visits of instruction were paid to poultry-keepers during the year.

“The Instructors have had a busy time and are doing good work, which is much appreciated by poultry-keepers.

“The improved facilities of motor transport provided by the Department have enabled the Instructors to get in touch with more poultry-keepers and render greater service to the industry, which is much appreciated.”

WOOL.

A good season was experienced by woolgrowers, as will be seen from the following report of Mr. J. E. Duncan, M.Sc., Live-stock Husbandry Officer and Wool Instructional Officer for the Department :—

“The wool-selling season recently closed has seen the best returns to growers for nine years. From sales in the Dominion of 663,798 bales £14,903,257 was realized. Exact figures for the number of bales sent direct to London by farmers for sale are not available, but a fair estimate is about 80,000 bales which will fetch in the vicinity of a further £2,000,000, making the handsome total of somewhere in the region of £17,000,000.

“A brief comparison of statistics for the last three years is interesting :—

“Wool sold at Public Auction.

	1936-37.	1935-36.	1934-35.
Offered (bales)	668,397	768,933	527,283
Sold (bales)	663,798	737,454	471,512
Sold (lb.)	226,089,994	258,270,784	162,538,056
Total proceeds	£14,903,257	£9,840,427	£4,401,010
Average price—			
Per bale	£22 9s.	£13 6s. 10d.	£9 6s. 8d.
Per pound	15·82d.	9·144d.	6·498d.

“Another interesting feature this year, quite apart from the generally high trend of values, has been the abnormally small difference in price between the finest and coarsest lines of wool. Usually the former types of wool are worth about double the latter—*e.g.*, at the first Wellington sale the previous season average Merino was fetching 14d. and average low crossbred 7d. This year at the last sale of the Wellington series both Merino and low crossbred averaged about 19d. It is often difficult to explain the vagaries of the wool market, but it appears that the strong demand and excellent prices for wool have been brought about by several factors,—

“(a) With brighter economic conditions and greater spending-power vast numbers of people have been replenishing their wardrobes and furnishings.

“(b) Stocks of wool in consuming countries were low, and there was very little carried-over wool at auction this season, so that current supplies were quickly absorbed and barely met the demand.

“(c) There can be little doubt that huge rearmament policies overseas have had a great influence on the demand for wool, particularly the coarser sorts.

“(d) Fashion in the dress trade also played a part.

“On the whole this season the wool opened up well, in many cases being somewhat lighter in condition than usual, due to the abnormally wet season. There were complaints from the Wairarapa district that there had been a disastrous and mysterious drop in the weight of the local wool clip. However, taken over a number of properties, this reduction in weight averaging about 11 per cent.

could be adequately explained as due to purely seasonal conditions without incorporating any mysterious causes. In any case, the light condition of the wool helped to enhance its value. There was a fair amount of stain and water-rot in evidence, as was to be expected due to the wet season, and some wools exhibited a break, but as is always the case when prices are high there were no complaints from buyers. These high prices for the lower-quality and inferior wools are not an unmixed blessing, for they invariably deal a serious blow to any progressive movement for wool-improvement, and lead in some cases to a slipshod preparation of the clip for sale, a number of growers pressing their wool 'all-in'—*i.e.*, not even bothering to skirt or remove the bellies—in the erroneous belief that during a period of high prices such practices will pass unnoticed.

"When a farmer can get as much, or more, for his coarse, inferior, and often hairy wool as he can for his super lines, a state of affairs which happened quite frequently this last season, he sees no incentive to improve his wool, blissfully forgetting previous experience and what will inevitably happen again. There is no shadow of doubt that in the long-run it pays to grow good wool and get it up attractively for sale.

"I have during the past season done all that I could to drive this point home to farmers and young farmers' clubs by demonstrations, lantern lectures, and exhibits at shows. There is no doubt that the Dominion organization of young farmers' clubs is an excellent medium for the dissemination of knowledge, as the members are nearly always alert and unbiased and keen to make use of any new knowledge they receive.

"Correspondence on a large variety of subjects has been dealt with, including requests for reports on wool samples. During the year a number of special reports have been compiled, and a fair amount of data has also been collected on the subject of woolscouring in New Zealand. A complaint from Bradford regarding raddle-stained wool was investigated and the matter cleared up satisfactorily. While in Wellington I have attended meetings of the Wool Pack Committee of the New Zealand Standards Institute and of the Sheep Dip and Wool Scouring Committees."

RABBIT NUISANCE.

The destruction of rabbits has proceeded satisfactorily throughout the year, and, with the exception of some areas in the South Island, most districts are able to report a decrease in the incidence of this pest. Rabbit Boards continue to do excellent work in their respective districts, and a large area of country is now under the control of these Rabbit Boards, with the result that several parts of the Dominion are now practically free of rabbits.

For purposes of destruction strychnine is now being more generally used in combination with carrots, oats, or jam. Other methods are used as circumstances warrant—*viz.*, phosphorized pollard, cyanogas, trapping, and shooting.

The improved position as regards rabbits may be attributed to, firstly, the high prices ruling for skins and carcasses, secondly, the wet season in many localities resulting in the drowning of young rabbits; and, thirdly, the enthusiastic work of Rabbit Boards.

NOXIOUS WEEDS.

The eradication of noxious weeds continues to be a difficult problem. Owing to suitable climatic conditions ragwort in particular made strong growth during the past season. The control of this weed was taken in hand by a good number of County Councils, particularly in the North Island, under a scheme approved by the Government and largely assisted by subsidized labour made available by the Employment Division of the Department of Labour. The luxurious growth and spread of ragwort during recent years has caused considerable concern, and from experience it would seem that local administration by County Councils is the most promising method for effective control. In the course of their operations these bodies also attend to the clearing of the weed on unindividualized Native land and unoccupied Crown land in the district, and altogether the work carried out by these Councils and their officers is most commendable. In dealing with ragwort in the South Island the judicious grazing of sheep is practised.

Variegated thistle is still causing concern in east coast districts of the North Island, all classes of land being infested. In many parts good work has been done by landowners, but the large area of infested land makes eradication a serious problem.

Some fairly good work has been done with blackberry, gorse, and broom. Much of the clearing is done during the months of winter, when farmers have more time to give it attention. The flame-thrower is being more widely used and has proved effective in destroying heavy stands of these weeds.

In portions of the South Island sweet brier is still proving a difficult weed to control, but some satisfactory work has been done in the clearing of Californian thistle.

Some County Councils are now stocking weed-killer as a convenient source of supply for ratepayers.

STAFF.

Acknowledgment is made of the loyal service of the staff throughout an arduous year, also of the co-operation of those not actually attached to the Live-stock Division.

VETERINARY LABORATORY, WALLACEVILLE.

REPORT OF C. S. M. HOPKIRK, D.V.Sc., OFFICER IN CHARGE.

It is pleasing to be able to report that Wallaceville, which has been mainly a diagnostic laboratory, is assuming the rôle of a Veterinary Research Station. There have been additions to staff and additions to the outbuildings, where experimental animals can now be kept under more sanitary conditions than hitherto. Permission for the building of a new laboratory to be staffed and devoted to research has been obtained from Cabinet. Co-operation with field officers is availed of whenever possible, and it is believed that the diagnostic service of the laboratory to the field is improving.

The development of the use in bulk of several types of vaccine has made it necessary to import material from the Commonwealth Serum Laboratories at a minimum cost to the farmer. The production of large quantities of vaccine is at present beyond the facilities of the Laboratory, and to be able to supply the country heavy expenditure would be required.

"Animal Health Notes," commenced several years ago under the editorship of Mr. D. A. Gill, followed by Colonel H. A. Reid, and now in the hands of Mr. L. W. N. Fitch, carry on as a medium whereby results of experiments and abstracts from journals not readily accessible to field veterinarians are placed in the hands of field officers. It is believed that this quarterly review is of practical use in departmental routine.

In making this report I should like to acknowledge with gratitude the excellent work carried out in their respective spheres by the whole staff of the Institute.

Staff.—Changes, by resignations and additions, have taken place during the year :—

(1) Lieut.-Colonel H. A. Reid, O.B.E., F.R.C.V.S., D.V.H., F.R.S.E., left the Laboratory in August, 1936, to take up the position of veterinary officer in the New Zealand High Commissioner's Office in London.

(2) Mr. J. Evans, Farm Overseer, was retired as from 1st May, 1936, and was replaced by Mr. P. McMillan from Winton.

(3) Dr. I. J. Cunningham returned from Sydney Veterinary School for the long vacation and carried out his usual work on male sterility.

(4) Mr. V. G. Cole, B.V.Sc., was appointed as Parasitologist to the Department and is stationed at Wallaceville.

(5) Mr. I. G. Watt, M.Sc., was awarded a bursary to study veterinary science at Sydney Veterinary School and is on leave from Wallaceville.

(6) Mr. J. G. Peddie, B.Sc., has been recalled from Samoa to take up duties at Wallaceville as Senior Laboratory Assistant in Bacteriology.

(7) Mr. B. A. Reynolds resigned to take up a similar laboratory position in Massey Agricultural College.

In order to place the laboratory work on a better footing, Mr. L. W. N. Fitch has been given the responsibility of all routine diagnostic work, with the designation of Veterinary Bacteriologist.

There are still many additions required to build the staff up to a standard which might be considered satisfactory. More particularly, research workers are needed in poultry, swine, and sheep diseases, and also in such subjects as sterility and mastitis of dairy cows.

Diagnostic Work.—The work of both Hamilton and Wallaceville Laboratories has been well sustained over the year. There has been an increase in milk examinations under the mammitis-control scheme at Wallaceville, and an increase in poultry specimens received. The appointment of an officer to investigate the position of disease in the poultry industry is becoming urgent, for many deaths have occurred from leukaemia and coccidiosis, both of which, with our present limited knowledge, are difficult to control.

The following material has been received for examination :—

	Wallaceville.	Hamilton.
Mastitis milk-samples—		
Routine—		
Positive	306	2,792
Negative	322	2,315
Control Scheme—		
A Group	3,852—60 per cent.	21,139 63·5 per cent.
B Group	2,220—34 per cent.	9,385—28·0 per cent.
C Group	384— 6 per cent.	2,828— 8·5 per cent.
Quarter samples	..	1,971
Biological test for T.B.	69	..
Contagious-abortion milks	7	..
Contagious-abortion wheys—		
Positive	..	149
Negative	..	296
Ewes' milk	9	..
Blood-samples—		
Contagious abortion—		
Positive	224	115
Negative	496	445
Pulpy-kidney ewes	107	..
Specimens from cattle (other than Johne's disease)	188	..
Johne's disease—		
Positive	133	..
Negative	184	..
Specimens from sheep	299	..
Specimens from pigs	196	..
Specimens from horses	16	..
Specimens from poultry	341	..
Tumours	59	..
Miscellaneous specimens	93	..
Biochemical Section	743	..
Total	10,248	41,426

CATTLE DISEASES.

Johne's Disease.—There has been some increase in the numbers of Johne's specimens examined. The majority of specimens have been from positive reacting animals which have been slaughtered under the Stock Act following test with Johnin. A large number of such reactors do not appear to be voiding Johne's bacilli, and scrapings from the mucosa of the alimentary tract in many cases fail to show the presence of the organism. Many reactors to the test are not clinical cases.

We are still much indebted to Mr. Dunkin, of the Mill Hill Laboratory, England, for the supply of Johnin used in New Zealand. Using a culture also supplied by him, we have made Johnin at Wallaceville which has proved on field test equally as satisfactory as that issued by Dunkin.

With the advent of half-yearly testing of those herds from which cases of Johne's disease have been isolated from time to time, there is now some indication of the numbers of cows which one may find on initial testing of a herd. It is too soon to have had many herds retested since culling of reactors has been carried out. However, the primary test on twenty-five herds consisting of 1,458 head of cattle yielded 127 reactors or suspicious reactors—8·7 per cent.—which have been slaughtered.

Mastitis.—The numbers of milk-samples being examined under the mammitis-control scheme show no diminution. The percentage of cows placed in C group has risen somewhat in the Wallaceville examinations over last year. This may be due to the entry of new herds. Hamilton figures are much the same. In his report from Hamilton, Mr. Kidd, the officer in charge of milk examinations, stresses the fact that in dealing with 41,000 samples, 33,312 of which belong to the mammitis-control scheme operating in seventy herds, he and his limited staff are working under pressure for the greater part of the year.

An attempt was made to get a useful statistical perspective of the results of the scheme, but for several reasons the figures obtained gave no indication of general improvement. This is due to entry of new herds from time to time, to the fact that a number of very large herds where milking of cows in strict order is not carefully controlled, are amongst the number examined, and also to the fact that farmers in the scheme cull fewer cows and milk more as a result of their knowledge of the state of the udder health of individual cows, thus making it appear that their herds are showing no improvement, whereas the farmers themselves are very well satisfied with the position.

Very little original work on the mastitis problem was accomplished during the year at Wallaceville, but a routine bacteriological test of the Laboratory herd was kept going. Mr. T. A. Blake, Veterinarian at Hamilton, has, however, given attention to treatment. He reports that 128 clinically affected quarters were treated—11 with chlorine, 24 with Entozon, and 93 with ammonia. All of these quarters were examined microscopically, but no cultural tests were made. Improvements, which in some cases appeared to be complete, occurred, and about sixty quarters were giving secretion normal in appearance following the treatment. The quarters are to be re-examined after calving to decide whether the cure has been permanent or merely temporary. Mr. Blake is inclined to approve of the ammonia treatment as being cheaper and possibly more efficacious than other methods. He stresses, however, the necessity for persistent attention over a period of a week or more with any treatment adopted.

An abortion-free herd of forty-six cows shows eight dry quarters upon microscopical examination.

Sterility.—The bulk of sterility work on bulls has been carried out in the Waikato by Mr. T. A. Blake. He has classified bulls by seminal examination this year into—Good, 24; fair, 29; poor, 37; bad, 19; sterile, 0. Two bulls entirely unable to serve were noted this year, similar to those recorded by Professor Lagerlof, in Sweden.

An important finding late in the season was the presence in a herd of cows in the Waikato of the Protozoan parasite (*Trichomonas bovis*). This parasite has been associated in other countries with temporary sterility in dairy cows, the infection being carried by the bull from cow to cow. In view of this a careful watch is being kept for it by field officers. Treatment of the infected herd is being carried out by Mr. Blake with lactic acid.

Male rat sterility work is reported upon fully by Dr. I. J. Cunningham in his attached report.

Grass Staggers (Lactation Tetany, Hypo-magnesaemia).—The use of dolomite in prevention of hypomagnesaemia was reported upon by Mr. D. Marshall in December. Thirteen farms were included, and where dolomite-treated ensilage or dolomite-licks were fed out, very little grass staggers was encountered, whereas cows on neighbouring farms not having access to dolomite or magnesium sulphate were frequently affected. After several seasons' use on farms where tetany had previously been observed it would appear that dolomite in ensilage acts as a preventative of the condition. Recently the theory has been advanced in England that tetany results from a high intake of manganese which temporarily depresses the intake of magnesium. Tables were given of farms where grass staggers occurred and farms which were free. Analysis of pasture in New Zealand has shown no such relationship between magnesium and manganese, but a method for estimation of manganese in the blood of cows is being perfected for use in the coming season so that the theory may be checked up.

SHEEP DISEASES.

Photosensitivity.—The Southdown lambs previously mentioned as having been obtained by crossing a photosensitive male with apparently non-sensitive females have this season been mated brother to sister. Lambing will occur in August, 1937.

A photosensitive Southdown ram lamb has been kept perfectly healthy on hay, chaff, and crushed oats, but readily becomes sensitive to light if placed on cut green rye-grass or clover. The rye-grass acts rather more quickly than does clover in producing irritation.

Circling Disease.—Numerous cures have again been reported, and specimens of heads and of live sheep have been received. While in all true cases of circling disease *Listerella* can be found present, yet the suspected carrier—the small *O. ovis* larva—has not been found present on every occasion in the nasal cavity. Where live sheep have been received at the Laboratory suffering from the disease the spinal fluid has been found turbid with cells, and on occasion organisms have been obtained on culture. There appears also to be an increase in round-cell content of the livers of sheep, particularly in relation to the small afferent blood-vessels.

Further brain inoculation experiments in mice and spine inoculations of sheep have failed to create a typical case of the disease and have failed to suggest the presence of a virus as a primary infection. The mode of entry of the organism is therefore still obscure.

Pneumonia.—A lobar type of pneumonia with considerable effusion of fluid into the pleural cavity has been noted in the Southland district. Many farms were affected and the disease had every appearance of being epizootic. The percentage of sheep affected on any one farm at one time was, however, small.

Laboratory examination revealed a definite gram negative organism constantly present. Lesions could not, however, be set up by any experimental means with this bacterium in healthy sheep, although temperature reaction occurred. Intravenous injection produced an arthritis from which the introduced organism was recovered.

No sign of parasitic damage of the lungs was observed, nor was the organism present similar to that described in New South Wales as causative of pneumonia in sheep there.

Arthritis and Stiffness in Lambs.—Further spraying of docked tails of lambs with culture of a sheep strain of *Erysipelothrix rhusiopathiae* has resulted in typical post-docking stiffness at six to nine days following the operation. Also, in lambs which have been received with stiffness as a symptom following docking, *Erysipelothrix rhusiopathiae* has been recovered from joint cavities and enlarged bursae.

The organism *E. rhusiopathiae* is not at fault on every occasion where paralysis or stiffness occurs, for lambs can be found showing spinal abscesses as a result of navel or docking infection, and due to a variety of organisms. It would appear, however, that the usual temporary stiffness results from docking infection with *E. rhusiopathiae* and only a small percentage of such cases become chronically infected to show enlarged joints.

Pulpy Kidney.—Vaccination experiments carried out by Mr. Dayus with a formalized culture prepared at Wallaceville have again proved satisfactory for lambs when the ewe has been vaccinated prior to parturition. Preparations have therefore been made to import quantities of vaccine from the Commonwealth Serum Laboratories of Australia, the dosage to be used being 5 c.c. and 10 c.c. for adult animals. Mr. Fitch is attempting to assess the degree of immunity conferred on the ewe and the lamb by vaccination, but has met with considerable difficulty because of the few healthy mice available. Results have not yet been finalized.

Contagious Ecthyma.—Quantities of dried scab were prepared and sent out to the field, principally Otago, to be applied to hoggets to prevent the condition known as stomatitis. The vaccine was standardized by sheep scarification methods before being issued. The final optimum dilution was found to be 1:500 in the material issued.

Parasites.—Various observations were made on round worm infestation of hoggets and the effect of drenching, but as the appointment of a Parasitologist (Mr. V. G. Cole) has been made, no report will be issued on the work until the results have been confirmed by the appointee.

Blowfly-control.—Mr. V. G. Cole has made valuable observations on the state of Blowfly Strike in Marlborough and is to continue this investigation next spring and summer in co-operation with Dr. D. Miller, of the Cawthron Institute, who is desirous of carrying out the biological work.

Liver-fluke.—Mr. W. V. Macfarlane, who had been temporarily attached to Wallaceville, but who recently was permanently attached, has worked on the intermediate host of the New Zealand liver-fluke. He has demonstrated successfully by rabbit-feeding of cercariae that the intermediate host is a pulmonary snail known as *Myas ampulla*. The exact type of swamp in which this snail may live has also been defined. It seems probable that the spread of sheep liver-fluke has been limited by the inability of this snail to live in all types of swamp.

Ragwort-feeding.—Four sheep and one cow have been fed since August with the green and fresh leaves of the rosette stage of Ragwort (*Senecio jacobaea*). The sheep have received 1 lb. each per day and the cow 2 lb. to the end of March, without ill-effect.

The experiment is to determine whether fresh rosette stage ragwort is toxic in prolonged feeding.

Cobalt Trials.—In the attached report by Mr. Josland on biochemical work of the Laboratory reference to cobalt experiments will be found. In addition to his report an experiment carried out in the Arohena district of the King-country has shown very conclusively the benefit which sheep and lambs derived from drenching at three days and weekly intervals as against a monthly interval. After several deaths amongst control sheep the remainder had finally to be drenched with cobalt. This drenching had the effect of stopping the mortality and keeping the sheep alive until the end of the experiment. A report on this experiment has appeared in the departmental *Journal*.

Enzootic Icterus.—Further cases of this disease have been examined, particularly for the Welch type of organism. Numerous attempts have now been made to isolate *B. Welch* or its variants, or to show the presence of a toxin in the gut by mouse inoculation, but without success. It is claimed in New South Wales that a type of *B. Welchii* is responsible for the condition of hæmolysis.

PIG DISEASES.

Specimens received from pigs during the year have been largely from mortalities of animals of the porker stage. Sudden death in fat porkers has been found associated very frequently with serious *Salmonella* infection. In fact, *Salmonella suispestifer* would appear to be the most serious organism in swine disease in the country. Streptococci also have, on occasion, been considered to be causative of mortality, but not to the same extent as *Salmonella*.

Zinc Poisoning.—Following upon the finding of excess zinc in the organs of pigs which died with symptoms of unthriftiness and stiffness, feeding experiments were commenced in conjunction with the Chemistry Division using zinc lactate as the most likely zinc salt to be found in the pig's food-supply. Zinc gains entrance by way of zinc lined iron pipes which are frequently used to run skim-milk and whey to the pig-yard. The zinc lining becomes converted to zinc lactate.

Experimental groups of pigs became stiff and then seriously lame and unthrifty. Post-mortem examination showed the epiphyses of bones to be softened and the cartilage to be separating from the bone in places. There was a collection of sterile fluid in affected joints. Apparently the zinc had partly replaced calcium in the bones, leaving the bones softened and porous. Muscle insertions were found to be torn from the bone in places causing extensive hæmorrhages. An article has been published in the *Journal* on the subject.

POULTRY DISEASES.

The main specimens during the year were cases of coccidiosis and lymphomatosis in its various forms. Loss from these two diseases has been increasing.

Lymphomatosis.—Fowl paralysis and leukemia have been common in the young birds of many flocks. Following the suggestion that fowl paralysis could be passed to clean birds by inoculation, numerous attempts were made by intravenous and subcutaneous inoculation of affected nerve tissue to pass the disease on to healthy birds. Affected birds have also been kept with healthy birds, but on no occasion has any trouble been caused by experimental means.

Cultural work on leukaemic birds has yielded no definite evidence to incriminate *Salmonella* types of organisms, as was suggested by previous work in that direction.

Histomonas Infection of Export Eggs.—Experimental trials are under way to attempt to produce *Histomonas* infection similar to that found present in London in eggs shipped from New Zealand.

Tuberculosis.—Evidence has been obtained and confirmed that pigs are becoming infected with *tubercle bacilli* of avian origin where fowls and pigs are run together. This is the first definite case of avian tuberculosis recorded in the country.

Salt Poisoning.—Salt poisoning has been frequently suspected in the past in sudden mortalities amongst fowls, and feeding trials with salt in increasing percentages were carried out by Mr. Josland to find what amounts the fowl could stand. His report will give details.

GENERAL.

No experimental work has been performed on dogs, horses, cats, or goats.

Arrangements were made, however, for a shipment of serum virus from Messrs. Burroughs Wellcome and Company for use in Napier to protect fifty dogs against distemper. The result of the trial has so far been good. One dog died—it is assumed from distemper—six dogs showed a rise of temperature following vaccination, but the remainder remained normal. Several months following the inoculation the dogs were reported well. No controls have been kept under identical conditions, the test being entirely a field trial, but many dogs unvaccinated live on the same and adjacent sheep-runs. Distemper is common in the district.

PUBLICATIONS.

(By Laboratory officers or resulting from Laboratory work.)

- “Tuberculosis in Farm Animals”—T. A. Blake, M.R.C.V.S. *N.Z. Journal of Agriculture*, 52, 226–231.
- “Dosing of Sheep for Control of Parasites”—C. S. M. Hopkirk, D.V.Sc. *N.Z. Journal of Agriculture*, 52, 254.
- “Vaccination of Ewes against Pulpy Kidney (Infectious Enterotoxæmia)”—C. V. Dayus. *N.Z. Journal of Agriculture*, 52, 289–292.
- “Deficiencies known or suspected in Live-stock Nutrition in New Zealand”—C. S. M. Hopkirk. *N.Z. Journal of Agriculture*, 53, 200–4.
- “Paspalum Staggers”—C. S. M. Hopkirk. *N.Z. Journal of Agriculture*, 53, 105–108.
- “Johne’s Disease”—E. H. Stephens and D. A. Gill. *N.Z. Journal of Agriculture*, 54, 1–7.
- “Vaccination of Ewes against Pulpy Kidney”—C. V. Dayus. *N.Z. Journal of Agriculture*, 54, 65–70.
- “Dipping Mortality associated with Vibrion Septique Infection”—C. V. Dayus. *N.Z. Journal of Agriculture*, 54, 170–1.
- “Treatment of Bush Sickness with Cobalt in the Arohena District”—C. S. M. Hopkirk. *N.Z. Journal of Agriculture*. (In press.)

NUTRITIONAL RESEARCH WORK.

Dr. I. J. Cunningham, Research Officer in Animal Nutrition, supplies the following sub-report:—

For the greater part of last year the writer was absent on leave and the activities of the section were under the direction of Dr. Marion M. Cunningham. Work has been continued on the relation between dietary protein and sterility, on magnesium metabolism, on vitamins A and D, and in other directions.

DIETARY PROTEIN AND MALE STERILITY.

In last year’s report reference was made to the production of sterility in male rats by feeding proteins of poor biological value. This effect is produced by a diet containing 70 per cent. of maize, the remaining 30 per cent. being made up of minerals, vitamins, &c., necessary to complete the ration for the purposes of growth. When wheat completely replaces maize in this ration all the rats are fertile. The hypothesis was formed that the different effect of these two rations was due to the different biological value of the contained proteins.

Further trials during the last year have been made with cereals other than maize or wheat. It has been found that when rye or barley is substituted for maize the rats fed these modified rations are fertile, whereas when oats is used as a substitute sterile rats are produced. From these results it appears, therefore, that wheat, barley, and rye are favourable foods for the male reproductive system, while maize and oats are unfavourable.

The question whether the differences between these cereals in respect to their capacity to provide nutriment for the testes is due to differences in the quality of the contained protein has also been investigated. Such investigation is possible since the degenerated state of the testes is the only apparent abnormality of male rats fed the maize and oats diets. The plan followed in the experimental work is to feed the maize diet modified by the addition of protein-rich supplements and to determine the influence of these supplements in preventing the testis degeneration which invariably results from use of the unmodified maize ration. Such a plan permits the effect of the supplement to be related directly to the development of the testes.

Supplements employed so far are dried bull testes, dried ripe unstripped salmon testes, dried yeast, and marmite. With dried bull testes alone or with salmon testes plus dried yeast or marmite as supplements to the maize ration testis degeneration was entirely prevented. The conclusion has consequently been reached that the quality of the protein is of prime importance for the nutrition of the testes. A detailed account of this work is being published in the *New Zealand Journal of Science and Technology*.

The work is being continued and expanded as rapidly as facilities of staff and accommodation permit. It is hoped to keep its application to domestic animals at the same stage by parallel experiments on large animals and by chemical investigation of the proteins of foodstuffs and other materials.

MAGNESIUM METABOLISM.

Grass Staggers.—Pasture samples from areas set aside in the Waikato district have been analysed regularly in order to collect further information and confirmation of previous results concerning the seasonal variation in the magnesium content of such pastures. The results are similar to those dealt with in the previous report.

More extensive trials with dolomite as a preventive treatment against grass staggers were instituted last season, and Mr. Marshall reports a very considerable measure of success. In spite of these hopeful results, however, it would seem desirable to continue the free distribution for at least another year before recommending its general use in the Waikato district. The additional experience will enable field officers to give a more authoritative statement regarding its value.

Dietary Magnesium and Urinary Calculi.—From work with rats on low magnesium diets the interesting observation has been made that bladder and renal calculi are found in rats fed diets with high calcium content but with abnormally low magnesium content. Addition of magnesium so as to bring the content up to normal prevents the formation of these calculi.

VITAMINS.

Assays of the vitamin contents of New Zealand fish-liver oils and of pig-foods have been made in continuation of the general plan to investigate these classes of material. Results of the assay for vitamin D in livers of various fish form the subject of a paper published in the *New Zealand Journal of Science and Technology*.

The vitamin A content of meatmeal has been found to be 19 international units per gram, while that of groper-liver oil is in the region of 30,000 units per gram.

This high vitamin A potency of groper-liver oil and the high vitamin D content already mentioned show that groper-liver oil is an extremely valuable vitamin concentrate comparable with some of the halibut-liver oils. It would seem desirable to encourage the commercial development of this oil. In this connection contact has been made with an overseas firm which reports that groper-liver oil could profitably be employed in the vitamin industry. Quantities up to several thousand gallons could be absorbed annually. It seems a regrettable fact that the groper harvest is small and that it is not so organized as to enable advantage to be taken of this profitable sideline.

MISCELLANEOUS.

Analysis of pastures and of such materials as nicotine sulphate have been conducted in connection with inquiries received from field officers.

Further work has been carried out on the toxicity of smuts. Samples of smut-infected materials and of pure cultures have been supplied by the Plant Research Station, but the work has not yet reached the stage where a report can be made.

The toxicity to rats of neutral lead acetate was investigated. Amounts of $\frac{1}{2}$ per cent., 1 per cent., and $1\frac{1}{2}$ per cent. of the ration were fed for a period of six months without loss of weight or death occurring. The lead was found to be stored in liver, teeth, and bones in amounts increasing with increased percentage of lead in the diet.

PUBLICATIONS.

"The Distribution of Magnesium in the Animal Organism and the Effect of Dietary Magnesium"—I. J. Cunningham. *N.Z. Jour. of Sci. & Tech.*, 1936, 18, 419.

"Grass Staggers and Magnesium Metabolism"—I. J. Cunningham. *N.Z. Jour. of Sci. & Tech.*, 1936, 18, 424.

"Further Data on the Vitamin D Content of New Zealand Fish Liver Oils"—Marion M. Cunningham. *N.Z. Jour. of Sci. & Tech.*, 1937.

"Further Evidence of the Relation of Dietary Protein to Sterility"—I. J. Cunningham, C. S. M. Hopkirk, and Marion M. Cunningham. *N.Z. Jour. of Sci. & Tech.* (In the press).

BIOCHEMICAL LABORATORY.

Mr. S. W. Josland supplies the following sub-report:—

The volume of routine work continues to increase, the total number of specimens dealt with for the period under review being 743.

The experience in experimental procedure gained at Adelaide in 1935, and a brief period of hæmatological study with Dr. C. J. C. Britton of the Christchurch Hospital Pathological Laboratory staff, has proved invaluable in application to some of our animal-health problems in New Zealand. During the past year liaison has been established and maintained with those Cawthron Institute research workers who are engaged in animal-health problems.

The following problems have received attention:—

BUSH SICKNESS.

At Glenhope, Nelson, in co-operation with the Cawthron Institute, periodical hæmatological blood-examinations on experimental sheep are being made. From a limited number of observations it is evident that the anæmia associated with bush sickness does not appear until the condition is very advanced.

At Mamaku a comprehensive experiment has been instituted to determine the following points:—

(1) The nature of the anæmia of bush sickness.

(2) The curative efficiency of various mineral supplements.

Groups of sheep are being treated as follows:—

(a) Control group, on untreated pasture.

(b) Cobalt-drench group, 0.1 mgm. cobalt per sheep daily.

(c) Cobalt-salt lick, 1.6 drams Co. $\text{Cl}_2 \cdot 6\text{H}_2\text{O}$ per hundredweight salt.

(d) Limonite lick.

(e) Untreated animals on a paddock top-dressed with limonite.

The animals are being weighed and examined for blood histological changes at regular intervals.

In addition, sheep at Wallaceville are being fed hay from Mamaku in an endeavour to produce and study the condition under laboratory conditions.

COBALT METABOLISM.

The observation by overseas workers that the feeding of cobalt to rats produces a polycythæmia has been confirmed so far as massive doses are concerned, but in an experiment in progress where rats have been receiving 1 mgm. Co. daily each, over a period of ten months, only one out of eight receiving Co. has so far developed a polycythæmia. The reason for this unexpected result is being sought. When four healthy sheep were drenched with cobalt sulphate equivalent to 1 mgm. Co. per 200 gr. body-weight daily, only one developed a polycythæmia. Two became anæmic, while one remained unaffected.

Two hoggets drenched daily with 5 mgm. cobalt as sulphate became anæmic after a period of ten months. In all treated animals there was small but definite storage of cobalt in the organs, the organs mostly affected being the liver and the pancreas. The experiments showed that the toxicity of cobalt even in massive doses for sheep is not acute, and provided farmers keep to the small doses recommended, then no danger is likely to ensue.

RATE OF EXCRETION OF COBALT.

Experiments conducted in conjunction with Dr. H. O. Askew, of the Cawthron Institute, have shown that when sheep are drenched with 4 mgm. cobalt only 2 per cent. of the cobalt administered appears in the urine, the remainder, beyond an indeterminate amount stored in the organs, being excreted in the faeces, the greater bulk being excreted during the first forty-eight hours. It follows, therefore, that drenching should be carried out every three or four days in order to maintain the absorption of cobalt at as high a level as possible.

MINERAL-DEFICIENCY.

A series of ash determinations on the bones of sheep of varying ages showed that there is considerable variation in the total ash content of the various bones in the skeleton of the sheep. The ash content of the head of the femur and proximal epiphysis of the humerus was found to be a reliable index of the degree of calcification. The ash values of a series of healthy lambs aged four to nine months indicate that calcification is relatively complete in the lamb at the age of four months.

Bone-ash determinations, when supplemented by blood analysis, are of great assistance in the diagnosis of mineral-deficiency diseases.

CALCULI.

Calculi submitted for identification from the Gore (Southland) area proved to be composed essentially of Xanthin. *Xanthin calculi* are common in the Moutere Hills district, but it is believed that this was the first occasion on which their occurrence had been demonstrated outside the Moutere Hills district in New Zealand.

SALT POISONING IN FOWLS.

From time to time extensive mortalities in fowls have occurred in which there has been reason to suspect poisoning due to common salt. In some cases investigated it has been difficult to incriminate salt owing to the very small amounts recovered from the digestive tract of the birds. Experiments have confirmed Suffran's (1909) findings that the lethal dose of common salt for fowls is about 4 grams per kilo of body-weight.

HÆMATOLOGICAL TECHNIQUE.

The use of corpuscular constants in the classification of blood devised by Wintrobe has been applied to all histological examinations. Some normal variations established are :—

					Sheep.	Rats.
Mean corpuscular volume in cubic microns	..	..	..	..	32-40	40-49
Mean corpuscular hæmoglobin percentage	..	..	..	..	31-38%	31-37%
Total Number of Specimens Analysed.						
Blood—						
Sheep	..	..	..	345	Bone samples ..	.. 44
Cattle	..	..	..	28	Urine samples ..	.. 9
Rats	..	..	..	268	Miscellaneous ..	.. 32
Horses	..	..	..	2		
Pigs	..	..	..	2	Total	.. 743
Fowls	..	..	..	13		

PUBLICATIONS.

The following articles have been published during the year :—
 “The Effect of Feeding Cobalt to Rats ” (1936)—S. W. Josland. *N.Z. Journ. Science and Technology*, Vol. 14, No. 5, 298.
 “A Note on the Colorimetric Estimation of Cobalt in Solution by Means of Nitroso-R-salt ” (1936)—S. W. Josland and J. W. H. Lugg. *Aust. Journ. of Experimental Biology and Medical Science*, Vol. 14.
 “Total Ash of Sheep’s Bones as an Index to Calcification ” (1937)—S. W. Josland. *N.Z. Journ. Science and Technology*, Vol. 18, No. 8, 665.
The following articles are in the press :—
 New Zealand Journal of Science and Technology—
 “The Effect of Feeding Excess Cobalt to Healthy Sheep ”—S. W. Josland. (Paper read at Auckland Science Congress, January, 1937.)
 “Rate of Excretion of Cobalt by Sheep after Drenching with Cobalt Chloride ”—H. O. Askew and S. W. Josland.

FIELDS DIVISION.

REPORT OF R. B. TENNENT, DIRECTOR.

The functions and work of the Fields Division are many and varied in character, but, broadly, the main objective is the improvement of the general farming practices of the Dominion. During the year under review the ramifications of the Division have further increased, and the ever-expanding nature of the work which the staff is called upon to perform requires a far greater general knowledge than has hitherto been the case. The increasing volume of work, together with work relating to new undertakings, has necessitated an increase in staff, and this position has been met to some extent.

Notwithstanding the increased volume of work requiring attention, matters in general have progressed smoothly, due to the whole-hearted manner in which the staff has tackled all duties assigned to it.

The main functions of the Division are reported on below under specific headings, following some brief remarks relative to the general climatic conditions during the year and a résumé of the 1936-37 season's arable crops.

WEATHER CONDITIONS.

A wide variation in the general weather conditions was experienced during the seasons from North Auckland to Southland. The outstanding point as regards most districts was the frequent, rather than heavy, rainfall which brought about a plentiful supply of grass difficult to control with the stock available.

In the Auckland Province the year, in general, was a wet one, resulting in excellent pasture growth. The attempt to save this growth by converting it into hay and silage was somewhat nullified by a great deal of the hay being damaged by rain.

In the Wellington-Taranaki-Hawke's Bay-Wairarapa area the year was notable for the exceptionally low temperatures generally recorded, the lack of sunshine during the late spring and early summer, and the heavy and frequent late December and January rainfalls.

As regards the South Island, the northern half of the Island had unfavourable weather conditions generally. On the West Coast more continuous wet weather prevailed than has been the case for many years past. In other parts of the area mentioned the weather during the winter was seasonal, but during the summer and autumn it was very unfavourable to crops owing largely to a rainfall more continuous than heavy.

The weather in Otago-Southland, with the exception of North Otago, was excessively wet with low average temperatures. A fairly good autumn in 1936 was followed by a mild winter, which in turn gave place to a cold, late spring, summer, and autumn, with fairly extensive flooding during those periods.

ARABLE CROPS.

The floods experienced in the South Island during the autumn of 1936 left the land wet and cold, and it was with great difficulty that farmers on the heavier soils managed to get their land prepared for sowing. In almost all cases wheat sowing was later than usual and some farmers used sprouted seed, with the result that germination was affected. It has to be admitted, however, that there were cases even where good, sound seed was used that the germination was unsatisfactory, and in most districts the crops did not tiller out in the usual manner, with the result that they were, on the whole, thinner than usual, and in most districts yields have been rather disappointing and several bushels per acre below expectations. Despite the wet weather this season the quantity of sprouted grain is small, and it is in much better condition than was the case the previous season. There has been considerable comment on the freedom of sprouted grain during the past season, but the non-sprouting is accounted for by the coolness of the temperatures prevailing. The abnormally wet season in Otago-Southland had a most detrimental effect on cereal crops generally. These crops had made good growth and promised to yield well, but in most districts it was found impossible to harvest the crops. In one district (the Taieri), which is the main wheatgrowing area of Otago, not more than 10 per cent. of the wheat was harvested in anything like decent condition.

As regards yields, that portion of the wheat crop threshed during the January-April, 1937, period, and amounting to 5,295,325 bushels, gave an average per-acre yield of 32.76 bushels, as against an actual yield for the 1935-36 season of 35.63 bushels. Although the average yield for the January-April period was less than the actual per-acre yield for the whole of the previous season, it is still greater than the per-acre yield obtained during 1934-35 by approximately 6 bushels per acre. It must be remembered, however, that the 1934-35 season was a poor one and the yields obtained then were the lowest on record for a number of years past, with the exception of 1931-32. The threshings of wheat up to the end of April accounted for 161,619 acres, of a total estimated area of 222,000 acres in wheat for threshing.

The oat crops were very variable throughout the main districts in which this crop is grown. In some places, particularly in Otago-Southland, heavy and continuous summer and autumn rains prevented a great deal of the crops being harvested. Fortunately this position did not apply in all districts, and in some the crops were good and yields were high. The estimated area sown to oats for the 1936-37 season was 295,600 acres, as against an actual area harvested

the previous season of 304,982 acres. Threshings for the January-April, 1937, period disclose a per-acre yield of 47.19 bushels, as against an actual yield over the whole Dominion for the 1935-36 season of 42.61 bushels. Up to the end of April, 1937, the returns show that 40,126 acres of oats have been threshed for a total yield of 1,893,697 bushels. The area threshed covers 65 per cent. of the area in oats and which was expected to be threshed.

It is estimated that 25,300 acres were sown in barley for the 1936-37 season, as against an actual area harvested the previous season of 21,582 acres. The barley crop generally has been fairly good and the grain of plump quality, but discoloured to some extent by the damp weather. It is obvious that there will be insufficient barley for Dominion requirements, and some importations will of necessity have to be made. The great bulk of the barley is for malting purposes, and a serious endeavour has been made of recent months to get brewers, maltsters, and other users of malting barley to contract for their full requirements for 1937-38. I am hopeful that the Department's endeavours in this direction will bear fruit and that the area to be sown to barley for harvesting next season will show an appreciable increase on that for a good many years past.

The area in potatoes in 1936-37 was estimated at 23,300 acres, as against an actual area for the Dominion for the previous season of 22,958 acres. As a result of the certification of potatoes by the Department the yields per acre have shown an appreciable increase and, further, the quality of the potatoes is a big advance on recent times. One is hopeful that in a very short space of time practically all crops of potatoes grown will be the progeny of certified seed, and when this position is brought about the state generally as regards yield and quality will in no way be comparable with that which obtained prior to the advent of potato certification. This year there has been a very strong demand for table potatoes from South America, and some quite large shipments have been made. Up to date the following are particulars of consignments of table potatoes shipped from the South Island to South American ports:—

	Tons.
s.s. "Hororata"	985
s.s. "Coptic"	1,145
s.s. "Port Caroline"	755
s.s. "Mahia"	1,325
s.s. "Norfolk"	1,508
s.s. "Tairoa"	2,566
s.s. "Westmoreland"	1,201
s.s. "Port Chalmers"	1,606
s.s. "Pakeha"	2,108
Total	13,199

It is expected that the season will close with total shipments amounting to 25,000 tons.

It must be fully recognized that the market in South America for New Zealand potatoes is of such value to the farmers of the Dominion that every possible step has to be taken to conserve it. The Department is fully conscious of this necessity, and has taken every step to see that only the primest quality of potatoes free from disease and mechanical injury are exported. Standardized new packs are being insisted upon, and it is fully anticipated that the condition, quality, and attractiveness of the shipments which have been exported this season will receive very favourable comment from the importers and result in increased trade in the future. It is felt that the Department is performing a real service to both potato-growers and merchants in the supervision of the potato-export trade, and for the coming season plans are being formulated which will result in its stabilization.

INSTRUCTION IN AGRICULTURE.

This phase of the Division's work, looked upon as possibly its main function, has been given as much attention as possible in the circumstances, but the amount of instruction imparted has not been as great as one could wish, owing to officers being engaged on new spheres of work and other urgent matters which had to receive attention. There is the point, however, that, concurrently with such work as certification, field experiments, and so forth, limited general advisory work to a certain extent is performed. This applies to practically all the ramifications of the Division and in connection with each service instructional work is automatically being carried out. The work of the field officers of my Division may be graded, broadly, into four divisions—(a) agricultural instruction, (b) crop certification, (c) investigational work, and (d) regulatory services. Most of these activities, particularly those in the first three groups, have a direct relationship with the work of the Plant Research Bureau, and it is considered that the extension into the field of the findings of the research officers of the Bureau cannot but have an excellent effect on the agriculture generally of New Zealand. In many instances there is very close co-operation between the Fields Division and the different sections of the Bureau, but, to my mind, there are a few cases in which this co-operation could be improved. I have recently prepared a statement on the whole matter and am making arrangements for this statement to be considered at an early meeting of the Plant Research Bureau Committee. As a result of the deliberations of the Committee I feel sure that in those few matters where the co-operation is not all that could be desired a wonderful improvement will be effected.

EXPERIMENTAL FARMS AND AREAS.

The Division continues in its control of the work on the seven experimental and demonstration farms scattered throughout the Dominion. A great deal of the work being carried out on these farms is of an intensive technical nature and the work of the Division is performed in close co-operation with specialist officers engaged in grassland research. Again, there is the point that quite an appreciable amount of the work by way of experiments and demonstrations is on a scale and of such a nature that a trial with a co-operating farmer would not be possible. It is in work of this particular description that these demonstration farms are of real and definite value. The majority of the farms are what may be termed subsidized farms, and the Department each year, in consideration of the useful demonstration work being carried out on these places, makes an annual grant to the committee responsible for the running of each place.

There is, however, a need for further testing stations on experimental areas, particularly in the South Island, where many serious problems confronting the farmer require investigation. I am definitely of the opinion that the establishment of a first-class experimental station in the South would be of considerable benefit to the farming community and would afford the officers of my Division the opportunity of investigating many problems which at present are not being given the attention which they merit. Steps are being taken to investigate the facilities offering in the South for the establishment at an early date of such an experimental station, and it is expected that when a full report on the subject is placed before the Government the necessity of such a station will be recognized and adequate finance for its establishment on a proper scale will be forthcoming.

RUAKURA FARM OF INSTRUCTION.

Another extremely wet year was experienced. Intermittent rain fell right throughout the period, but the winter was fairly mild and feed was never actually short at any time. When spring growth commenced difficulty was experienced in controlling pasture-growth, and later on suppression of weeds was a very big problem. The previous year was considered bad for harvesting operations, but the one under review was, unfortunately, worse. Only one field of hay was harvested in good condition: the balance, if not somewhat spoilt by rain after it was cut, was over-ripe before it could be cut, on account of the weather. Haymaking operations extended over a very long period, commencing on the 10th December, 1936, and not being completed until the 17th March, 1937. Taking everything in, however, it may be considered that the farm had quite a successful year. A very pleasing feature was the renewed interest taken in the farm by the farmers. Actual visits of quite large parties of farmers were made, and, in addition, a large number of individual farmers visited the farm.

Following the usual practice, no annual sale of surplus stock was held on Ruakura, but all such stock was sold at the Combined Breeders' Sale held at Claudelands during September. There is no question that this method of the disposal of stock is less costly to the Department than the holding of an annual sale on Ruakura itself. At the sale twenty-one yearling and two-year-old bulls were disposed of at an average price of £16 4s. 7d. The demand for Ayrshire stock was exceptionally keen. Shorthorns were in fair demand, but Jerseys were not greatly sought after.

Pig-breeding was carried on on similar lines to previous years with the two breeds maintained at Ruakura—viz., Berkshires and Tamworths. A phenomenal demand has existed right throughout the year for Berkshires, but there has not been a very great demand for Tamworths. The average prices realized for pedigree pigs during the year were quite good and the average price for 100 Berkshires, including boars, sows, and weaners, was £6 3s. 7d. For Tamworths the average price for boars and sows was £7 0s. 4d. In this latter breed only fifteen head were sold as against 100 in the Berkshire breed.

With respect to dairy stock, the year commenced with a total of 131 cows in milk and finished on the 31st March with 130 cows in milk. Fifteen cows and heifers were placed under C.O.R. test conditions and twenty-four under O.H. test conditions during the year. The butterfat sold realized approximately 3d. per pound more than for the previous season.

The alterations which were carried out at the old cow-shed just prior to the end of the 1936 winter had the effect of making a great difference to the time and convenience in handling the herd at each milking. This is all to the good.

In the sheep section the flock sheep did exceptionally well, and 107 per cent. of lambs were tailed. The position with regard to fattening the lambs was not, however, as satisfactory as could be wished, as owing to the long feed and the cool weather conditions the lambs were late in maturing and consequently were later than usual in being ready for killing.

As a result of the decision to centre a large amount of experimental work at Ruakura, a greater general interest is being taken in the activities of the farm, which should play a most important part in investigating many important problems. Amongst the work in progress are pasture-top-dressing problems of the Waikato which are being investigated by way of mowing trials, pig-feeding trials, and ragwort investigation. In addition, a number of small trials have been carried out with fodder crops and cereals, and preparations are being made to investigate the Waikato feed-flavour problem and sterility in bulls.

Ruakura Farm Training College.—The attendance at this college has been disappointing. For the first term in 1936 there were less students in residence than has been the case since the college has been in existence. This poor attendance is accounted for largely by the shortage of labour on farms and the demand for boys in city businesses. One feels sure that this state of affairs must be only temporary, and there is little doubt that in the very near future the attendance at the college will be back to normal.

In addition to the regular college operations, courses were held during the 1936 winter for unemployed boys, and in this connection there was both a junior course and a senior course. The junior course was held from 8th to 19th June, and an attendance of twenty-three boys was given a comprehensive course of lectures and demonstrations relating to the more important practical aspects of farming. The senior course lasted from 22nd to 27th June and was attended by eighteen youths. This course was designed on intensive lines, and included special lectures and demonstrations on pastures, cultivation, and live-stock.

FIELD EXPERIMENTS.

This branch of the Division's work has continued to increase, and each year the activities become more varied in character. At the end of the year there were 976 experiments or demonstrations in progress throughout the Dominion and the majority of these are being conducted on a co-operative basis with farmers. The experiments in operation cover a great variety of subjects, particularly in respect to pastures, such as mowing trials, observational top-dressing, strain trials, grazing trials, pasture establishment, and experiments and demonstrations under several other headings. With respect to crops, the experiments relate to the manuring of the various cereal and root crops and the trying-out of new varieties. In addition, there were conducted experiments aimed to discover the means of controlling brown-heart in swedes, and also a very comprehensive series of experiments to determine the best districts in which to cultivate sugar beet and the most suitable varieties, both from the point of view of yield and sugar content. Apart from the above-mentioned experiments, quite an appreciable amount of experimental work was put in hand dealing with the control of ragwort and pig-feeding trials. This latter class of experiment is of particular moment at the present time, in view of the Department's endeavour to bring about as rapidly as possible a considerable improvement in pig-management methods.

The Crop Experimentalist attached to my office is in immediate charge of the whole programme of experimental work of the Division, and appended hereto is a comprehensive report by that officer on all classes of experimental work in hand for the year ended 31st March, 1937.

There are, however, two major projects which in the future will require to be given more consideration than has been the case in the past. I refer particularly to the problem of hill-country deterioration in the North Island and the regrassing of the depleted tussock areas of the South Island. The deterioration of hill country in the North Island is a most serious problem of ever-growing intensity, and it is obvious that if steps are not taken immediately to investigate the causes of its deterioration, and, if possible, to effect a remedy, much valuable land which hitherto had a relatively high stock-carrying capacity will be abandoned to fern and secondary growth. Already many settlers have had to abandon their holdings, and others are merely struggling along in a fight against almost overwhelming odds. It would appear that the problem is one largely bound up with the question of such settlers obtaining easy credit for the purchase of seeds, manure, fencing, and stock to combat the weed-intrusion. Large-scale experiments in which I envisage the possibility of the Department taking control of several farms would appear necessary to secure the fullest information of how to rehabilitate this class of country.

So far as the depleted areas of the South Island are concerned, it will be recognized that the large tracts of semi-barren country, particularly in Central Otago and the McKenzie Country, require the closest investigation with a view to increasing their carrying-capacity. At one time these areas carried a wealth of natural pasture affording an abundance of feed for sheep, but with the passing of time, due largely to overstocking, rabbit-invasion, and injudicious burning, the native pastures have been woefully depleted, and to-day large tracts of virtually barren areas exist in place of the excellent native pastures of by-gone days. The striking work of the late Dr. L. Cockayne, who conducted a series of experiments on the Dunstan Mountains, has given a lead to the method by which regeneration of the tussock areas may be effected, but further extensive work in this connection requires to be carried out. The possibility of introduction of grasses and other plants adapted to the soil and climatic conditions of the tussock areas has not yet been fully exploited, and this should be done at the earliest possible opportunity. Proposals to investigate these two major projects are in hand, and it is expected that during the coming season facilities will be forthcoming to fully investigate the position.

FEED-FLAVOUR INVESTIGATION.

The study of pastures and the correlation of feed flavour with pasture type was continued in the Morrinsville district. Results confirmed those of preceding work as well as those obtained independently at Massey Agricultural College by the Dairy Research Institute. Further experiments designed to discover a method of control of feed flavour were conducted. In this direction, in addition to continuing the use of nitrogenous fertilizers on some pastures, heavy applications of phosphatic fertilizers were made on others. The weakness of co-operative experiments when pasture-management is beyond the control of the Instructor prevented the carrying-out of the experiments as was originally intended. The results obtained, however, indicate the trend of future work and allow of definite

recommendations for the control of feed flavour being made. The following practices are now confidently recommended for improving cream-quality, including the reduction of feed flavour, and at the same time increasing production :—

- (1) Never hard-graze pastures for long periods, particularly in the winter and early spring. Hard grazing weakens the rye-grass and encourages white clover. Very lenient grazing in the winter and early spring, on the other hand, strengthens rye-grass by increasing its root system and weakens clovers by smothering. A system of long spells between rapid but lenient grazings should be adopted. The adoption of recommendations as above to some extent alter the normal winter feeding of stock, as winter spelling of pastures can only be successfully carried out by commencing feeding out before it really becomes necessary.
- (2) Another recommendation is to top-dress in April or May about four good pastures which have been adequately phosphated and limed with sulphate of ammonia at 1 cwt. or $1\frac{1}{2}$ cwt. per acre and lime at 3 cwt. per acre. These fields should be closed to stock and should be only lightly grazed in the late winter and early spring.
- (3) Avoidance of the use of "night paddocks" as far as possible should be adopted, because permanent "night paddocks" slow up the "phosphate-clover-stock-nitrogen-rye-grass" process.
- (4) In periods of strong feed flavour the most grassy pastures should be grazed during the day and those containing most clover during the night. In addition, cows should be kept off the clover pastures for about four hours prior to afternoon milking.
- (5) Where possible, good hay should be fed when feed flavour is prevalent.
- (6) At all times, but particularly in periods of strong feed flavour, attention should be paid to cleanliness and to the cooling of the cream.

PIG-FEEDING EXPERIMENTS.

Experiments have been conducted to ascertain the place of maize in wintering pigs on dairying farms, particularly in the Auckland Province. In this connection one particular experiment was conducted with nine pigs of the Tamworth-Berkshire cross with a mean live-weight of 65.8 lb. These animals were placed on a diet of $\frac{1}{2}$ gallon separated milk and 3 lb. of soaked maize per day on 12th May, 1936, and allowed the free run of a $\frac{1}{2}$ acre white-clover field, and in addition were given as many swedes as they would clean up. They were fed in this way until 29th July, when they had consumed $328\frac{1}{2}$ gallons of separated milk, 1,971 lb. of maize, and 2,704 lb. of roots, and had gained 73 lb. in live-weight. This indicates that for each 100 lb. of live-weight gained there was consumed $44\frac{1}{2}$ gallons of milk, 267 lb. of maize, and $361\frac{1}{2}$ lb. of swedes. These pigs were later fattened on skim-milk alone and produced first-grade carcasses.

Some preliminary investigations with later feeding of suckling pigs from about three weeks until weaning have given valuable information for further work during the coming season. This work will aim at testing the relative value of the supplementary foodstuffs commonly used by the pig-farmer. It promises to be work of considerable value as a source of information for pig-recording clubs and departmental officers, and should also provide a source of fundamental information by the examination of carcasses of young pigs fed rations differing widely in their composition and nutritional value.

LAND-UTILIZATION.

Largely because the farming outlook has changed rapidly in New Zealand as in a number of overseas countries, during recent years there has been an ever-increasing realization of the value of accurate information relative to agricultural conditions, trends, and possible modifications and adjustments. If desirable progress is to be made the reasons why changes are being made or should be made must be understood not only by farmers, but by business men and by others interested in agriculture in its relation to the national welfare. Further, the growing complexity of social and economic forces affecting farmers makes a knowledge of the present position and of prospective developments a matter of prime moment.

These facts underlie the increased attention which is being given to land-utilization studies in New Zealand. The major current work in this sphere is the survey of the economic structure and of the social services of Hawke's Bay. Both the urban and the rural communities of Hawke's Bay are interested in and are assisting in the work of the survey which is sponsored by an inter-departmental Land Utilization Committee. Considerable progress has been made during the year in that section of the survey which concerns itself with the agriculture or farm husbandry of Hawke's Bay. This agricultural survey aims to secure and interpret the facts that are available relative to such questions as crop husbandry, animal husbandry, farm income, farm-costs, farm organization, land-utilization, farm transport, and marketing.

The work has been divided into two main sections—farm practice and farm management—which, however, tend to merge into each other, so that at times it is difficult to say whether a matter is one of farm practice or of farm management.

Though the agricultural survey is far from complete, certain important facts have already emerged relative to the farming of Central Hawke's Bay under normal price-level circumstances. Among these are :—

- (1) The production of many of the present dominantly fat-stock-production farms profitably can be increased substantially.
- (2) In many instances farms which at present produce both fat stock and store stock profitably could be devoted to fat-stock production.

- (3) Mixed breeding and fattening of stock could more frequently be carried out profitably in the area in which the majority of the farms are now devoted to breeding exclusively.
- (4) The carrying-capacity of a substantial portion of the area devoted exclusively to breeding profitably could be increased considerably.

The first three of these facts point to the possibility of an increased proportion of fat lamb in our export trade. This would be especially valuable should any tonnage limitation be placed on our exports, in which case each pound of meat exported should be of the greatest possible value. The fourth fact listed above points to a source of the increased supply of breeding-ewes required for an increased fat-lamb production.

The importance of investigations relating to land-utilization is of such moment that it is proposed to extend the work to other districts in the Dominion.

ARTIFICIAL FERTILIZERS.

There has been a definite increase in the sales of fertilizers and lime during the year just ended, due no doubt to the known and assured income from dairy-produce and to the better prices received for most other forms of primary products. The practice of top-dressing pastures is a very commendable one, and all officers of the Division are fully alive to the value of bringing about this practice to a greater extent than has been the case in the past, even although an increase in the amount of fertilizer and lime used is being shown from year to year.

In the South Island a definite tendency has been taking place to use basic superphosphate instead of superphosphate for pasture top-dressing. The advocates of this change-over affirm the fact that the results obtained justify the procedure, but, apart from the rights or wrong, of this claim, it would definitely appear illogical to first produce a water-soluble phosphate which in the past has proved to be of the highest value for top-dressing purposes and then immediately convert it into a di-calcic form of less solubility. It has to be admitted that southern pastures in the main require liming, and, provided that top-dressing with superphosphate is preceded by liming where necessary, there would appear to be little reason in advocating basic superphosphate in place of superphosphate for top-dressing purposes. It is obvious, however, that the claims made for basic superphosphate in preference to superphosphate require the closest investigation, as does the place of basic slag and various citrate soluble phosphates, and investigations in this connection are taking place and will be extended in the coming season.

MEETINGS OF FIELD OFFICERS.

The practice has been adopted of arranging that once in each year each Fields Superintendent shall call a meeting of the instructional staff under his control. At these meetings various phases of the Department's work are discussed, and the free and frank discussions which take place are of the greatest value to all officers. I feel sure that all officers who have attended these meetings realize their value to the full, and although the conferences last for only two days each Instructor returns to his district better equipped to carry on his work as a result of his association with fellow-officers and through having taken an active part in all the discussions.

SEED CERTIFICATION.

The seed-certification operations have during the year proceeded along the usual channels quite smoothly. Considerable development has taken place with respect to those crops already under the certification scheme, but no new crops have been dealt with. In some instances the certification scheme has been amended, but all amendments have been only after very serious consideration and have been made in all cases towards simplification of certification process. The scheme inaugurated by the Division last year of growing on contract pedigree strains of perennial rye-grass and white clover has continued and has been extended. Unfavourable harvesting-conditions in 1936-37, unfortunately, were reflected in the yield of certified Government stock perennial rye-grass and white-clover seed, and the Department was not able to fulfill all orders coming to hand from and through merchants. In actual fact, orders were on hand for at least twice as much seed as was harvested and could be supplied. It is pleasing to note that the progressive farmer fully realizes the value of seed of pedigree and selected origin, and there does undoubtedly exist a wide scope for development in this respect. Divisional officers are fully aware of the advantages to be obtained by farmers sowing the best seed, and every effort will be made to increase the quantity of such seed available.

The certification operations of the Division are under the immediate control of the Certification Officer attached at headquarters, and his report dealing comprehensively with all aspects of certification is appended.

IRRIGATION.

During the year several schemes were reported upon for various purposes, the principal one being the projected scheme for the Maniototo district. This scheme, if gone on with by the Government, will irrigate 80,000 acres and will be by far the biggest single scheme in the Otago District. With respect to the irrigation schemes already in operation, it was found that owing to the wet season the number of times areas had to be irrigated were fewer than usual and in some instances the irrigations were actually not required. The staff of the Division has been arranged to cope with the large number of requests received for advice on irrigation matters, and it is pleasing to record that an excellent degree of co-operation exists between this Division's officers and officers of the Public Works Department. The fact that Divisional officers, who are experts as regards irrigation matters, are being consulted more and more by officers of the Public Works Department is all to the good, and this must enhance the results obtained in the future from irrigation practices.

FARMERS' FIELD COMPETITIONS.

Field-crop competitions have been carried on in various parts of the Dominion on much the same lines as in past years. The one point that stands out is that in districts where in the past root-crops competitions have held a great deal of interest for farmers, this interest shows a lessening. As against this, hay, silage, and pasture competitions continue generally in favour. The pasture competition is rapidly increasing, and the good work which one expects from these competitions is very apparent in those districts, particularly in Taranaki, where such competitions have been in vogue for some years. The competitive side of the movement, while it actually is necessary as an initial step, sooner or later becomes the least important aspect of the movement.

YOUNG FARMERS' CLUBS.

The Young Farmers' Club movement, which has been in operation since 1932 and has extended from year to year, has received considerable attention during the year to which this report refers.

Towards the end of the winter of 1936 the movement was reorganized and district organization of the movement was placed in the hands of the Fields Division. An officer of the Division was appointed Organizing Secretary for the Dominion, his headquarters being at Wellington. At the time the organization was taken over by the Department there were eighty-six clubs in operation—fifty-nine in the South Island and twenty-seven in the North. Since that time considerable progress has been made, and, while a few of the smaller clubs in isolated districts have gone out of existence, forty-five new clubs have been formed—eleven in the South Island and thirty-four in the North Island. At time of writing the number of clubs functioning throughout the Dominion is 122, being made up of sixty clubs in the South Island and sixty-two in the North Island. The total membership of all clubs is approximately three thousand. There is still room for considerable expansion, particularly in the North Island, but one of the difficulties to be faced is that the staff of the Division has its hands so full with a multitude of duties that it is unable to put into the Young Farmers' Club movement as much attention to organizing the movement as could be desired. As it is at present, all Instructors in whose districts the clubs are a feature have to devote a considerable amount of their own private time in the evenings to attending meetings and giving lectures.

Notwithstanding anything said above, the value of the Young Farmers' Club movement is fully recognized, and every effort will be made to increase not only the number of clubs, but the number of club members as staff becomes available, which will enable the present large districts to be subdivided.

A feature of the Young Farmers' Club movement is the holding of educational weeks and also tours through districts new to club members. These educational weeks and tours can undoubtedly be of great value, and the results so far obtained have warranted the enthusiasm and work put into the organizing of such functions.

PURCHASE OF SEEDS AND MANURES.

The system inaugurated some years ago under which this Department was made the purchasing Department for all seeds and manures required by Government Departments and institutions has operated very smoothly, and the value of the seeds and manures purchased has run into many thousands of pounds. The system in operation, particularly with respect to supplies of seed, assures that all seeds purchased are of high quality both from the point of view of purity and also germination. The sowing of this class of seed on Government properties is undoubtedly a step in the right direction, and the pastures of those properties that have been sown down since purchases were made through the channels of this Department show the wisdom of buying only seed the quality of which is known prior to purchase.

FLOCK HOUSE.

On 1st February, 1937, the Government completed the purchase of the Flock House Estate, comprising some 8,000-odd acres, near Bulls. On this station a training-school is conducted for lads between the ages of fourteen and a half and eighteen years. At the time Flock House Station was taken over and passed to the immediate control of this Division the accommodation as regards trainees was fully occupied. Quite a number of the trainees have since completed their period of training, and in accordance with the procedure adopted in the past have been apprenticed to approved farmers, and the vacancies at Flock House filled. At the moment there are fifty lads in residence, and there is a fairly lengthy waiting list. It is evident that Flock House is not capable of providing tuition in agriculture for all the New Zealand lads whose parents or guardians are desirous of their receiving such instruction. Under the Flock House Trust the period of training was of eight months' duration, but immediately the Government assumed control this was lengthened to twelve months. There is no charge made either for board or instruction, and this, combined with the fact that the instruction imparted is really good and of a general character, no doubt tends towards the popularity of Flock House.

Farming operations on Flock House have been conducted during the two months of the year it has been under Government control along the same lines as hitherto.

SEED-TESTING.

The year under review was a record one so far as the Seed-testing Station is concerned, and the number of samples received for analysis show an increase of 2,806 on the number for the previous year. The increase in work has been so rapid that it was with great difficulty the staff was able to cope with the work. This position has lately been remedied by the appointment of additional staff and the provision of additional equipment. Further, the accommodation available has been rearranged and slightly added to, with the result that henceforth the station will be better able than in the past to render prompt and efficient service.

Attached hereto is the report of the Seed Analyst, who deals in detail with the work under his immediate control.

REGISTRATION OF FERTILIZERS.

The registration and certification of fertilizers and fertilizer-vendors was carried out as usual during the year as one of the Division's activities.

All superphosphate-works, a number of freezing, boiling-down, and other works, were inspected, and both official and unofficial samples of fertilizers of various kinds were obtained. In some cases technical phases of manufacture and sale of fertilizers were investigated.

Twenty-two lots of official samples of fertilizers were collected for analyses from fertilizer works and stores and over ninety visits of inspection of premises of vendors and manufacturers made.

A considerable number of unofficial samples of fertilizers were either examined or submitted for analyses of fertilizing ingredients.

In special circumstances samples of lime, weed-killer, and stock-licks were qualitatively examined.

Several samples of fertilizers were collected for estimation of their cobalt content and further samples for examination of radio activity.

A close scrutiny was kept on all imported fertilizers, imported slag and other materials of foreign origin being periodically examined or sampled.

Very few samples or complaints were received from farmers. Apparently they are satisfied with the quality of the goods they are receiving.

It is to be hoped that the Dominion market will absorb all the blood-and-bone and other similar types of organic manures which are manufactured from the carcasses of animals grazing the pastures of this country. The comparative high price and the growing scarcity of blood-and-bone fertilizer is handicapping the market gardener and grower to some extent at the present time.

The price of ground Nauru phosphate in the North Island requires further investigation as there are soil types on which this class of raw phosphate could be used to economic advantage.

A considerable amount of work appears to have been done in connection with synthetic substances that regulate growth in plants, and on the market has appeared various proprietary compounds which purport to regulate the growth of plants by prior treatment of their seeds.

This aspect of growth regulation requires much careful study and experimentation in view of some of the extravagant claims made for proprietary compounds offered to the public, following upon the work of scientific men overseas.

THE PHORMIUM INDUSTRY.

No considerable improvement has been experienced in the bad times through which the hemp industry has been passing during the past several years. There has, however, been a slight increase in the amount of hemp and tow milled. The output of hemp for 1936-37 was 39,792 bales, an increase of 4,265 bales over the figures for the preceding year. As regards tow, the total output of 12,732 bales showed an increase of 1,364 bales over the corresponding figure for 1935-36.

DEPARTMENTAL PHOTOGRAPHY.

The photographic section of the Division located at Palmerston North continues to render excellent service not only to officers of the Fields Division, but to all other sections of the Department requiring photographic services and to research institutions such as the Plant Research Bureau, the Dairy Research Institute, Massey Agricultural College, and others.

The class of work put out by the departmental photographer is of a very high standard, and this is one of the reasons why his services are so sought after by those requiring photographs, lantern slides, &c., outside the Division.

STAFF.

I desire to place on record my sincere thanks for the whole-hearted support received from all officers of the Division during a very particularly busy year.

FIELD EXPERIMENTAL WORK.

Mr. J. W. Woodcock, Crop Experimentalist, supplies the following sub-report :—

The investigational work carried out by officers of the Fields Division continues to increase, and each year these activities become more varied in character. At the present time 976 experiments or demonstrations are being conducted throughout the Dominion, and most of these are carried out on a co-operative basis on private farms. Close collaboration in many of the projects is maintained between the Fields Division and the various branches of the Plant Research Bureau, and much of the work outlined below represents the translation into field and district practice of research work carried out by officers of the Bureau. A detailed summary of experiments in progress is given in Appendix A.

DESCRIPTION AND PROGRESS OF EXPERIMENTS.

(1) GRASSLAND.

(a) *Yield Trials under Mowing and Grazing Technique.*

At Marton Experimental Area seven trials are being conducted, and these investigate the following:—

(1) *Different Methods of applying Carbonate of Lime.*—The first four-year period of this experiment has just been completed, during which an initial dressing of 2 tons carbonate of lime gave 11 per cent. increase over no-lime, as against 7 per cent. increase from a 1 ton application. Smaller dressings of 10 cwt. every two years and 5 cwt. every year gave responses rather less than that obtained from the same quantity of lime applied as a single initial dressing.

(2) *Trial of Limestones from different Sources and different Degrees of Fineness.*—Two distinct types of limestone, one a fairly hard stone and the other a soft stone, are on trial and these are applied in the form of commercially ground, coarsely ground, and finely ground material respectively. The results after two years do not show any marked differences although the commercial and fine samples are both slightly better than the coarse samples.

(3) *Trial of Super, Basic Slag, and Gafsa (North African) Phosphate on Limed and Unlimed Ground.*—After four and a half years' work on this experiment the yields from unit quantities of phosphate in super and slag show similarity, while equivalent amounts of phosphate applied in the form of Gafsa have given about 5 per cent. lower production. It is indicated that the performance of both slag and Gafsa has been improved during the past two wet seasons, since in the first two years super was distinctly superior to both slag and Gafsa. Liming (carbonate 1 ton initial and 3 cwt. per acre annually) has improved the performance of super by about 7 per cent., but has only made slag and Gafsa more effective by about 3 per cent. and 4 per cent. respectively.

(4) *Trial of different Forms of Nitrogen.*—This experiment has been discontinued recently. The nitrogenous fertilizers under trial—viz., sulphate of ammonia, ammoniated super, Nitrochalk, and nitrate of soda—all gave responses soon after application varying from 10 per cent. to 20 per cent., according to season, but such increases usually disappeared several weeks after application and were followed by periods of production lower than that of the no-nitrogen plots. This "slumping," which brought down the increases from nitrogen over any particular season to the vicinity of 3 per cent., occurred in spite of adequate supplies of phosphate, potash, and lime being maintained. The application of the phosphate and nitrogen at the same time as in ammoniated super did not mitigate against these undesirable after-effects as compared with sulphate of ammonia and superphosphate applied separately.

(5) *Trial with different Cocksfoot Strains.*—In this trial Akaroa cocksfoot is compared with the Aberystwyth, Danish, and C. 23 strains. Over a four-year period Akaroa, Aberystwyth, and C. 23 have been about equal in yield of dry matter, whereas Danish cocksfoot is much lower in production. The plots of the latter are now virtually white-clover plots as the cocksfoot has disappeared.

(6) *Trials with Pedigree Lines of Rye-grass and Clovers as compared with Certified Lines.*—Two methods are employed in carrying out this investigation but only a few months' data is available.

(7) *Pasture Cultivation Trial.*—This aims to investigate the effect of drastic harrowing a good rye-white pasture. Much has been said regarding the benefits to be derived from pasture cultivation apart from the mere spreading of cattle-droppings. As the experiment is on sheep pasture, the effects from spreading animal-manure are of minor detail. After two years the results indicate that no increase in production has been obtained from pasture cultivation either in autumn, winter, or both autumn and winter.

At Ruakura Farm of Instruction four mowing and grazing trials are being carried out to investigate the use of lime, phosphate, and potash on the major soil types of the Waikato. As the response to lime has been general in these experiments, which are on newly-sown pasture, and this does not bear out observations from trials previously conducted on old pasture, it is necessary to find out whether there is a difference of lime reaction on old and new pastures respectively. To this end a further mowing trial is to be laid down in the near future.

(b) *Observational Top-dressing Experiments.*

About four hundred observational trials are being carried out on pasture to investigate the effects of phosphate, lime, and potash on various soil types. Most of these now also include a comparison of different forms of phosphate. Results of these trials are published from time to time in the *New Zealand Journal of Agriculture*.

(c) *Demonstrations and Trials of Grass and Clover Strains.*

Areas which serve both for experimental and demonstrational purposes are established in nearly all districts. They include the desirable and undesirable strains of the main herbage species and also introduce to farmers the new pedigree lines which are brought out periodically by the Grasslands Division of the Plant Research Bureau.

(d) *Grazing Trials.*

Of the six experiments carried out in which production of one treatment is compared with that of another by means of grazing units, two compare potash dressings with no potash in Taranaki, while the remainder are designed to measure the production of different rye-grass strains. One of the latter has recently been laid down at Winton Experimental Area to compare the better-type Southland seed with certified rye-grass under sheep grazing, and records are to include weights of lambs reared on the respective areas.

(e) *Clover-inoculation Trials.*

These trials, which investigate the effect of inoculating red and white clover seed, are being continued, although in some experiments recently laid down the value of different strains of culture produced at the mycological laboratory is being investigated. Although some good results have occasionally been obtained from inoculating clover-seed, the position is yet too obscure to make definite recommendations.

(f) *Subterranean Clover Experiments.*

Thirty-two experiments are being conducted with subterranean clover. These include strain trials in districts where the species is already being extensively grown, ecological trials in other districts, and a number of exploratory trials on hill country to determine whether by means of subterranean clover top-dressing can be profitably exploited. Further experiments are to be sown this autumn.

(g) Investigations into Effect of Pasture on Feed Flavour.

A survey of the incidence of feed flavours in the Morrinsville district confirmed previous findings that clover-dominant fields when grazed often give rise to relatively high intensities of feed flavour as compared with rye-grass-dominant fields. Co-operative field trials during the past season investigated the possibility of manuring with nitrogenous fertilizers or heavy dressings of phosphates as a means of increasing the rye-grass content of grassland. It is now recognized, however, that management of pasture may have as much bearing on the desired changes of sward as manuring and that complete control of grazing management is necessary in such experiments; consequently this work is now being conducted at Ruakura Experimental Farm, where an area is being subdivided for purposes of the investigation. Close touch, however, is still being maintained with certain areas in the Morrinsville district which were treated experimentally last season.

*(2) CEREAL CROPS.**(a) Manuring of Cereals.*

Fourteen experiments were conducted on the manuring of wheat, oats, or barley, and these chiefly investigated the use of sulphate of ammonia on stubble-sown crops. As in previous seasons, the responses from nitrogen varied considerably even on stubble-sown wheat crops. It is difficult to determine just what factors govern the profitable use of sulphate of ammonia. Further evidence was available indicating that the optimum quantity of superphosphate to use with the wheat crop in Canterbury is from $\frac{3}{4}$ cwt. to 1 cwt. per acre.

(b) Wheat-variety Trials.

Close collaboration was maintained with the Wheat Research Institute in carrying out twelve trials with wheat varieties in various districts. In Canterbury Cross 7 again proved itself capable of yielding as much as Solid-straw Tuscan, while the Portugese variety, Tainui, once more showed its value as a suitable wheat for spring sowing. Trials of lines of Cross 31, another crossbred wheat from the Institute, indicated that the best lines were likely to outyield Tuscan. Other varieties tried out were Beneubbin, Lin Calcl, and Jumbuck. Tainui and Taiaroa were included in small-scale trials in the North Island in comparison with Jumbuck, and the results suggested that field trials with Tainui in the Manawatu district would be warranted during the coming season.

(c) Oat-variety Trials.

Several oat-variety trials were laid down, and outstanding results were obtained from the variety known as "Resistance." This variety is rapidly finding favour in the South Island, but owing to its susceptibility to rust it does not appear suitable for North Island conditions.

(3) POTATO MANURING.

The results from sixteen trials in the South Island investigating the effect of phosphate, nitrogen, and potash are not yet to hand.

(4) TURNIP MANURING.

Four experiments were carried out with turnip fertilizers in Canterbury. The treatments included a mixture of equal parts super and carbonate of lime, super plus blood and bone, reverted super, and a proprietary turnip fertilizer. Germination counts indicated that the three last-mentioned fertilizers affected germination adversely as compared with super plus carbonate of lime.

(5) CONTROL OF BROWN-HEART IN SWEDES.

Much work is being carried out on the use of borax as a controllant of brown-heart in swedes in view of the encouraging results in the previous season. Unfortunately, however, the present season's trials have indicated that under some conditions damage to seedlings may become serious from the use of even small quantities of borax when applied with seed and fertilizer. Consequently the use of borax as an admixture with fertilizer is open to some risk. The most favourable method of applying borax appears to be as a top-dressing prior to sowing.

(6) SUGAR-BEET EXPERIMENTS.

At the request of the Bureau of Industries a series of sugar-beet trials was carried out to investigate the districts most suitable for growing the crop, the probable yields, and the working-costs likely to be involved under field conditions. Satisfactory yields were obtained in most trials, especially in Hawke's Bay and South Canterbury, but results in Otago and Southland were adversely affected by flood conditions.

MISCELLANEOUS.

Pampas-grass.—Several experimental areas and numerous farmers' crops of pampas-grass have been kept under observation. Plantations established from root cuttings show poor strikes, and although seedling establishments have been good, farmers have not as a rule properly fenced the areas to keep stock out. It is possible, however, that in the near future accurate information on the feed obtained from pampas-grass plantations will be available from the experimental areas.

Ragwort-eradication.—A considerable volume of work has been put in hand in connection with ragwort-control, and at Ruakura Experimental Farm a systematic study of all phases of ragwort-growth is being carried out. Several thousand plants have been set out for chemical treatment next season.

Pig-feeding Experiments.—At Ruakura Experimental Farm several pig-feeding experiments are being carried out. The growing of crops suitable for pig-feeding is under investigation and dried grass as a supplement to dairy by-products is being tried out.

Other Trials.—Experiments which have not been classified above include trials with onion varieties, soya beans, varieties of maize, dry-dusting of grass-seed, experiment on pasture establishment, and lucerne manuring trials.

GENERAL.

The large increase in the number of co-operative experiments during the last two years has necessitated a good deal of extra work being carried out by field officers of the Division, and such work, often requiring long working-hours, has been ably performed. I wish also to acknowledge the clerical assistance put at my disposal, particularly the willing and efficient help of Misses M. Pirie and N. Crawley in dealing with the large volume of statistical work.

APPENDIX A.

SUMMARY OF EXPERIMENTS LAID DOWN, DISCONTINUED, AND CARRIED ON, 1ST APRIL, 1936, TO 31ST MARCH, 1937.

Type of Experiment.	As at 31st March, 1936.	Discontinued during the Year.	Laid down during the Year.	As at 31st March, 1937.
1. Pastures—				
(a) Mowing trials	9	..	4	13
(b) Observational top-dressing	452	98	70	424
(c) Strain trials	99	4	21	116
(d) Grazing trials	4	1	3	6
(e) Inoculation of clovers	119	21	18	116
(f) Subterranean clover trials	1	..	31	32
(g) Feed-flavour investigation	42	35	..	7
(h) Pasture establishment	17	3	21	35
(i) Management methods	4	..	..	4
2. Crops—				
(a) Manuring of cereals	12	14	16	14
(b) Wheat varieties	9	12	12	9
(c) Oat varieties	6	6	2	2
(d) Potato manuring	18	18	16	16
(e) Turnip manuring	7	7	5	5
(f) Control of brown-heart	18	20	41	39
(g) Sugar-beet trials	..	2	31	29
(h) Rape varieties	..	..	6	6
(i) Maize varieties	2	2	5	5
(j) Other crop experiments	28	22	10	16
3. Miscellaneous—				
(a) Pampas-grass investigation	27	..	2	29
(b) Control of ragwort	4	5	27	26
(c) Pig-feeding trials	..	1	4	3
(d) Other trials	11	9	22	24
	889	280	367	976

SEED CERTIFICATION.

Mr. J. H. Claridge, Certification Officer, supplies the following report:—

During the past year operations relative to the system of Seed Certification have proceeded along the usual channels. No further crops have been included in the scheme, but considerable development has been shown in regard to those crops already under certification. The scheme covering white-clover seed has been amended along lines which simplify the process of certification while the scheme covering seed wheat has also been subject to modification. The minimum standards of purity applicable to machine-dressed seed of the various grasses and clovers were raised prior to commencement of the 1936-37 season. In most cases no difficulty has been found in the machine-dressing of seed to comply with the higher standards adopted.

PEDIGREE SEEDS.

The contract growing of pedigree strains of perennial rye-grass and white clover seeds has been continued and extended. Owing to unfavourable conditions the yield of certified "Government stock" perennial rye-grass amounted to only 700 bushels. On the other hand, orders received from merchants were sufficient to absorb almost twice this quantity. A good harvest of certified "Government stock" white clover seed was obtained from one area, but the seed crop from several other areas was a failure. A little over 1,000 lb. of seed was distributed in response to inquiries from merchants, amounting in the aggregate to over 1,300 lb. Inquiries were also received for supplies of pedigree strains of Montgomery red clover and Italian rye-grass, but no seed of these is yet available. All the nucleus stocks of rape-seed were placed with merchants for multiplication under certification.

From the above remarks it will be seen that there is a ready demand for seeds of pedigree and selected origin, and that there exists a wide scope for development in this respect.

PERENNIAL RYE-GRASS.

A reduction of almost 25 per cent. has been recorded in the acreage entered for certification in the 1936-37 season. This falling off is accounted for mainly by the greatly reduced acreages entered from Hawke's Bay, Poverty Bay, and Manawatu, and is no doubt an indication that the farmers in this territory are not so hard pressed financially as has been the case in recent years. During the twelve months ending 31st March, 1937, an increase was shown in the quantity of seed entered for certification in the "Commercial" class. One hundred and fifty-six thousand bushels were offered, two-thirds of this quantity being accepted as certified seed. It is interesting to note that whereas it was anticipated that the "Commercial" scheme might result in reduced acreages entered in the South Island for certification under the field inspection method, in actual practice these acreages are being maintained. Advantage is being taken of the conditions of certification under the "Commercial" scheme to extend the scope of certification beyond those areas which are eligible for field inspection and certification following thereon.

It has been unfortunate that adverse seasonal conditions over practically the whole of the rye-grass seed areas have resulted in the seed harvested in the 1936-37 season being below normal in regard to germination. In some instances germination has been so reduced as to make the seed practically worthless.

COCKSFOOT.

Entries for cocksfoot-seed certification show an increased acreage coming under the scheme. Growers have experienced the worst seasonal conditions for many years, with the result that much of the seed harvested is so light that it has been found impossible to obtain anything approaching a reasonable standard of purity for the machine-dressed product. Particularly has this been so in the case of seed harvested from Banks Peninsula. As a result of the foregoing, the quantity of cocksfoot finally sealed and tagged for the season will be much lower than usual, despite the increased acreage entered.

WHITE CLOVER.

Considerable work has been done by various officers in the past few years to evolve a more rapid method than the plot test for the determination of type in respect to white clover. A suitable laboratory method having been developed, it was decided during 1936 to replace the existing scheme of white clover certification by a scheme somewhat similar in method of operation to that employed in the certification of perennial rye-grass seed in the commercial class.

The scheme, which classifies the white clover accepted into "mother" and "permanent pasture" as formerly, was brought into operation at the beginning of January, 1937. During the first three months 120 lines, totalling almost 200,000 lb. of seed, were offered for certification. Of this quantity, 22,000 lb. were classified as mother seed and 129,000 lb. as permanent pasture seed. The advantages of this method in extending the benefits of certification are best realized when it is stated that in these three months, before most of the new season's seed came on the market, the total quantity certified under the new scheme was in excess of that certified in the two preceding seasons under the previous existing scheme.

RED CLOVER.

A considerable increase has been recorded in the acreage of Montgomery red clover entered for certification. The demand for certified seed of this type of clover is considerably in excess of the supply, and prospective purchasers are at times finding it impossible to obtain seed. In view of the likely development of the overseas trade there seems ample scope for a considerable increase in seed production in respect to this crop.

BROWN-TOP.

The acreage of brown-top entered for certification remains fairly constant at about 24,000 acres. The quantity actually harvested is likely to vary considerably, however, in that farmers will only strip those portions of the area entered which are likely to return a payable yield of seed.

ITALIAN RYE-GRASS.

The certification of Italian rye-grass seed is becoming firmly established, 650 acres having been submitted for inspection in the 1936-37 season. The seed harvested is, in some instances, lower than normal in regard to germinating capacity, but this fault is fairly general in all this season's rye-grass seed.

The strain quality of the certified seed is a great improvement on that of any seed of uncertified origin.

PHALARIS TUBEROSA.

A mercantile firm has further interested itself in the production under certification of *Phalaris tuberosa* seed, following upon the results obtained from its efforts of the previous season. The area at present under certification is 85 acres, but, in the main, the yields are low, and not a great quantity of seed will be harvested.

POTATOES.

The scope of the certification scheme covering seed potatoes which in previous years had been confined to crops grown in the South Island was extended in the 1936-37 season to include certain crops grown at high altitudes in the Ohakune district of the North Island. A total of approximately 2,500 acres was inspected in the field, the greatest proportion of this area being located in the Canterbury district.

The potato certification scheme is perhaps the one most enthusiastically accepted at the present time, growers and merchants alike according it their full support. Not only is the quality of crops in regard to purity and freedom from disease being improved, but growers are also appreciating the advantages appertaining to the more careful grading of both the table and the seed produce of their crops. This in turn enables merchants to negotiate with more confidence in the quality of the product offered.

It is confidently expected that a large South American market will be available for table potatoes this season, and to supply this demand merchants are already interesting themselves particularly in the table produce of crops under certification. Inquiries from the same country are also being received for the supply of seed potatoes, it being stipulated that only certified seed will be accepted. Such a recognition from an overseas country of the value of this Department's certification scheme is very encouraging.

WHEAT.

The wheat certification scheme has been the subject of a few alterations in procedure, which, it is expected, will result in the farmer being able to purchase the certified article with still greater confidence. Chief among the amendments is the insistence that all grain must reach a reasonable standard of dressing, and the recognition as finally certified of that wheat only which has reached the required standard and has been officially tagged and sealed. As a result of these alterations there is being shown a great increase in the quantity of certified seed-wheat being machine-dressed.

While a further increase is recorded in the acreage under certification the general position at present is that little improvement can now be made in regard to existing varieties. The scheme will continue to perform a useful service, however, in the maintenance of the present high standards, and will be invaluable in the proper control of any new varieties, or of any selections of existing varieties which may be introduced to commerce from time to time.

RAPE.

With the complete failure of the nucleus stocks of rape-seed of the Broad Leaf Essex type in the 1935-36 season, there was available for distribution for seed production in the 1936-37 season only supplies of seed of the Giant type. This seed was sown out under certification on three areas comprising 30 acres. Yields were lower than those obtained in the previous season, but the seed harvested is of good quality. The development of rape-seed production appears to be merely a matter of time.

GENERAL.

In certain crops it would appear that the extent of the certification scheme has almost reached its maximum point of development, until such time as a greater overseas demand eventuates for seed of such crops. In other crops there is still ample scope for extension, and it will be seen that this development is in fact taking place. The increases in the areas of Montgomery red clover and Italian rye-grass seed illustrate this point. It is hoped that in the near future, with the finalization of investigational work at present under way, the certification scheme will be extended to other pasture and crop seeds.

The accompanying table records the acreages entered in the various crops since the inauguration of seed certification in 1927.

The large volume of detailed inspection and supervision work necessitated by the seed-certification scheme has been undertaken in the various districts by the Field staff of the Division.

Seed.	Acreages Inspected each Season.									
	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	*1936-37.
Potatoes	821	909	1,200	1,334	1,146	1,154	1,322	1,882	2,420	2,500
Wheat	473	1,184	2,277	3,289	1,063	1,873	2,937	2,545	5,538	8,300
White clover	..	325	664	311	31	100	538	1,284	948	†
Perennial rye-grass	..	..	3,028	6,539	9,709	22,917	13,236	11,351	12,114	9,200
Brown-top	..	..	22,000	24,900	18,300	14,860	17,150	24,490	23,670	25,000
Cocksfoot	..	..	..	..	4,226	5,097	5,485	7,886	7,073	9,100
Montgomery red clover	..	..	..	..	9	71	168	392	325	550
Turnips, swedes, and rapes	..	..	..	..	..	..	128	..	31	30
Italian rye-grass	..	..	..	..	..	..	..	305	472	650
<i>Phalaris tuberosa</i>	..	..	..	..	..	..	..	..	20	85

* Approximate.† Not available due to change in method.

SEED-TESTING STATION.

(N. R. Foy, Seed Analyst.)

For the year ending December, 1936, 18,115 seed samples were received for analysis, this number representing an increase of 2,806 on the number for the previous year, and is a record for the Station. From the point of view of samples worked the New Zealand Station now ranks easily in the world's first ten, but on an average maintains a technical staff of less than half than that of any of the established stations. The standard of work, therefore, is not beyond criticism, but with the available facilities the utmost is done to provide reliable services which have, not inaptly, been termed the "backbone" of the seed trade, both export and domestic. During the past year, as the result of the introduction of necessary short-cut methods, there has been some justifiable criticism of the New Zealand official certificates. However, if the proposals now under consideration eventuate successfully, the Station will be in a position to render the services of a standard usually required of a State institution.

The total number of samples represented 28,500 tests, consisting of 10,824 single and duplicate purity analyses; 15,650 triplicate germination tests, and 2,026 (8 x 100) examinations of perennial rye-grass under ultra-violet light, an increase of 500 examinations of the number for 1935.

The bulk of the samples represented commercial lines and indicated a high standard of quality. In this respect it is true that low quality on the New Zealand retail market is, unfortunately, rarely sampled for testing and that much of it is priced in excess of value. This is particularly true of farmers' dressed lines of certified rye-grass, of which, in Hawke's Bay particularly, there exists a fairly extensive, and what may be termed "an authorized retail trade."

SPECIAL TESTS.

Of the total of 2,026 ultra-violet light examinations, 576 were made on samples of certified perennial rye-grass for the Department's own information in respect of the production areas, 128 for other official activities, 603 as a basis of qualification of machine-dressed lines as certified seed in the commercial class, and 719 on behalf of merchants, preliminary to entry of lines for commercial certification.

As indicated, 603 officially drawn samples, representing 163,124 bushels of seed, were submitted for ultra-violet examination to determine eligibility for certification. Of these, 427 lines, representing 113,979 bushels, were accepted as certified commercial perennial rye-grass.

A total of 1,297 samples of machine-dressed certified seed samples were examined for purity to determine conformity to the required standard of analytical purity. Of this number, 32, or 2.5 per cent. were rejected as having failed to attain to standard.

From the 1st January, 1937, when the certification of white clover became based entirely on the picric-acid test, to the 31st March samples representing 139 lines were tested and of which 98 were passed (177,290 lb.) and 41 rejected (44,999 lb.) as certified seed.

Approximately four hundred special analyses for the purposes of the Canadian Seeds Act have been made and certificates accordingly endorsed as authorized by the Canadian Department of Agriculture.

Exporters have also been advised, where required, as to the possible conformity of intended shipments to the Australian Federal Quarantine and State Acts, which service has enabled many exporters to enter the Australian trade with greater confidence than hitherto.

INVESTIGATIONAL.

(1) *Seed Peas*.—As a result of the decision of the New South Wales Government to administer the various Acts in respect of the importation of peas on germination tests made in soil, a very considerable amount of work has been done with peas, particularly in soil-testing and its relationship to germination tests. Co-operative tests and examinations were also conducted by the New South Wales Department and this Station, and on the complete results obtained both Departments are now in a more enlightened position as to the technique and uniformity of soil-testing and its usefulness as a measurement of field establishment.

In conjunction with this work, an investigation is in progress regarding the effect of various mercurial dusts on the germination-capacity and vigour of soil establishment of peas. Some very interesting and favourable results have been secured, but observations as to the effect of the degree of soil moisture, relative adherent properties of the various dusts, are required before reliable data can be secured.

(2) *Dormancy in Oats*.—The study of the factors influencing the rate of after-ripening of oats has been continued. Apart from the intrinsic value of the work it is considered that the findings will prove of value to the solution of germination and maturation problems in other seeds. The institution of special low temperature tests on all samples of oats received and which indicate potential germination-capacity of dormant lines has met with general approval, particularly during the past unfavourable harvesting season, when incomplete and irregular ripening was general. Work on after-ripening has demonstrated that storage at temperatures higher than normal and at a reduced moisture content results in a considerably hastened maturity during bulk storage.

WHITE CLOVER : PICRIC-ACID TESTING.

Preliminary studies using this laboratory chemical test for the determination of strain in white clover were brought to a successful conclusion during the past year, and the method was brought into practical use this year as the basis of certification for the two established classes—mother seed and permanent pasture—reported upon herein. The absolute necessity for consistency in technique has been responsible for persistent experimentation to this end. It has been observed that factors may operate right from the commencement of the germination of the seedlings to interfere with the final chemical reaction.

Attention has also been paid to the colorimetric classification of the tests and data have been secured from the use of a Loviband tintometer, which indicates in colour units the intensity of the reaction. Following further work it is hoped that it will be possible to adopt this method of classification as standard practice.

PERENNIAL RYE-GRASS : LOW GERMINATION.

Work has been concentrated mainly on confirmation of previous findings as to the nature of the infection responsible for the trouble, by field observations in the Manawatu and with the co-operation of field officers throughout New Zealand by the examination of flowering and seeding heads secured from production areas. On the evidence obtained there remains no doubt that fungus attack is the primary factor, which is fully confirmed by the results of further inoculation experiments in the laboratory when inoculated plants have borne diseased inert seeds and the control plants clean viable seed. From the experience gained in the examination of green sheaves and the development of a special technique it was found to be possible to gauge the degree of attack and to estimate probable percentages of germination, which information has been of considerable value in the recent production season when the incidence of the disease was abnormally high.

Additional tests and examinations of seed saved from a wide range of plants of various types have been made in co-operation with the Grasslands Division of the Plant Research Bureau. The only possible means of overcoming the trouble in districts susceptible to the disease appears to be by the segregation of resistant strains, which, at best, in view of all the circumstances, is a very remote possibility.

Other activities include—

- (a) Observation of the influence of the applications of borax to the soil upon the germination of swede-seed and the condition and health of the seedlings—in collaboration with the Crop Experimentalist.
- (b) Further observations on the photoperiodic reaction of red clover, which it is considered would provide a means of estimating the proportion of perennial and temporary strains.
- (c) Examination and testing of samples of ragwort-seed collected by various officers from chemically and variously treated plants.
- (d) Examination and identification of seeds collected from sheep in different districts.
- (e) Preliminary work in connection with the official grading of malting barley.
- (f) Special tests for the presence of black mustard (*Sinapis nigra*) in imported swede-seed. This impurity has caused concern to several New Zealand importers.
- (g) The identification of various seeds collected and submitted, and of impurities of commercial seed, and stock and fowl foods.
- (h) Determination of the moisture content of seeds, grain, and peas prior to conditioning or shipment.
- (i) Soil-tests on peas and other agricultural seeds.
- (j) The carrying-out of referee tests in collaboration with the International Seed-testing Association, Copenhagen, the results of which compared very favourably with those of the main European Station; also tests on behalf of various Australian Stations with an exchange of difficult material.

GENERAL.

The usual amount of correspondence relative to the Station's services and seed matters generally has been dealt with. In October, 1936, the Seed Analyst attended conferences of the Australian seed-merchants and the Australian departmental officials at Adelaide. The knowledge and experience gained in discussion in matters pertaining to the New Zealand-Australian trade, uniformity in seed-testing technique, the application and administration of Australian Seed Acts, and the utilization of New Zealand seeds in Australia has proved of great value, and as a result the Station has been able to be of much greater assistance to the New Zealand-Australia seed trade. Subsequently, a very close touch has been maintained with officials and merchants in each State, and if the statements of those concerned are to be accepted, the visit has resulted in a better understanding between Australian and New Zealand officials and commercial interests, and of significant benefit to our trade.

For the year ending December, 1936, New Zealand exported 4,000 tons of grass and clover seed valued at £260,000, and imported 500 tons valued at £49,000. Nearly half of the export was entered at Australian ports and one-third was shipped to the United Kingdom. The bulk of the importation consisted of subterranean clover (approximately 30 per cent.), Timothy (25 per cent.), paspalum (10 per cent.), and alsike (10 per cent.). Both import and export showed an increase on the quantities and values for the previous year. In view of the fact that seed-export may be regarded as more or less of a "catch" trade, our annual export to the value of over £250,000 may be regarded as satisfactory, particularly as it is not directly assisted.

STATE SEEDS PURCHASING.

During the financial year 480 requisitions for seed-supplies were placed on this office by various Departments. Selections were made from a very wide range of quotations, in some instances over one hundred lots being offered for only one item. The purchase of approximately 400 tons of seed to the value of £32,724, and 105 tons of seed potatoes to the value of £820, were authorized. In the entire absence of complaint from ordering officers or from suppliers, it can be accepted that the system of seeds purchasing is functioning satisfactorily and certainly to advantage.

PHOTOGRAPHIC SERVICE.

From the date of reorganization of this section (1st February, 1937) to the 31st March the following photographic work was completed for Government Departments and other agricultural research institutions :—

Photographs (field and studio)	..	..	..	..	139
Prints	..	..	..	..	901
Lantern slides	..	..	..	..	199
Plates and films for development	..	..	..	..	202

The photographer's accommodation still leaves much to be desired, and it is hoped that in the near future it will be possible to have very necessary improvements made.

DAIRY DIVISION.

REPORT OF W. M. SINGLETON, DIRECTOR.

THE SEASON.

Climatically, the winter of 1936 was a fairly good one, with the result that cows started the new season in good condition. This was fortunate, for the reason that 1936-37 proved to be one of the coldest and wettest for many years, with a minimum of sunshine. Feed, however, was plentiful, there being an excellent growth of grass, and cows should be well prepared for the coming winter. On the other hand, a lack of sunshine kept the grass soft, thereby affecting the character of the milk and complicating the process of manufacture in the dairy factories. In districts such as North Auckland, Hawke's Bay, Nelson, Marlborough, and Canterbury, where the summers are usually a little too dry from a dairying point of view, the past season was almost ideal, production being up and dairy stock in good condition. The districts which suffered most were Westland and the far South, where extremely wet and cold weather was experienced almost without intermission. In some districts dairy-farmers found difficulty in haymaking, owing to the unsettled weather, and many crops rotted in the paddocks. Fortunately, the rapid growth experienced enabled a second cut to be made, and on the whole there should be ample hay and ensilage for winter use. In Otago and Southland where root crops failed in many cases the outlook is not so favourable.

PRODUCTION.

For the year ended 31st March, 1937, 151,436 tons creamery butter and 89,966 tons cheese came forward for grading, as compared with 145,990 tons butter and 86,250 tons cheese for the previous year, an increase of 5,446 tons butter (3.73 per cent.) and 3,716 tons cheese (4.31 per cent.). Reduced to a butterfat equivalent the increase represents 5,968 tons, equal to 3.85 per cent. It is expected that figures for the dairying year (ending 31st July) will evidence a greater increase owing to the sunnier and more favourable weather conditions experienced from March to May.

EXPORT VALUES.

Taking the Customs figures as a basis of export values, and including all dairy-produce—that is to say, butter, cheese, cascin, dried milk, condensed milk and cream, and milk sugar—there is an increase of £3,139,210, the total values for the two years 1936-37 and 1935-36 being £21,784,928 and £18,645,718 respectively. Due allowance, however, should be made for the fact that there was an increase in exports of 13,760 tons of butter and 3,086 tons of cheese, as well as increased quantities and improved prices for the various by-products. The 147,085 tons of butter exported during the financial year ending 31st March, 1937, were valued for Customs purposes at £15,967,343, and the 84,887 tons of cheese at £5,253,692.

GUARANTEED PRICES.

The Government's guaranteed-prices scheme, with price differentials according to grade, has caused a greater responsibility to be thrown on officers of the Division, as the prices have been paid on a grading split up into five classes for both butter and cheese instead of three as hitherto. The new system necessarily slows up the work of the dairy-produce graders as well as adding to the labour of recording and general compilation of returns.

ZONING.

The work of the Executive Commission of Agriculture (commenced last year) in connection with the zoning of supplies of cream to creameries has made considerable progress, and as the result of negotiations already completed, or at present under consideration, seven creameries in the North Island and five in the South Island, chiefly proprietary concerns, will close during the coming winter, while one additional concern in each Island is likely to close.

The zoning of supplies to some of the remaining creameries has in a number of instances been taken in hand, and adjustments by exchange or purchase have been made between companies whose collecting vehicles have overlapped one another. It is anticipated that these arrangements will result in a considerable saving in collection-costs and an improvement in the quality of the cream received at the creameries.

No work of this nature has yet been done in connection with the supply of milk to cheese-factories, and it is anticipated that a number of the smaller ones will close down at the end of the season.

CREAMERY BUTTER.

The Auckland Province continues to maintain its lead in the production of creamery butter, and of the 151,436 tons sent forward for grading, 105,287 tons were graded at the Auckland port, 119,114 tons, or 78.65 per cent., being classed as finest, 30,800 tons, or 20.34 per cent., as first, and 1,522 tons, or 1 per cent., as under first grade. The arrangement whereby all butter of lower quality than first grade is disposed of through a channel which prevents its coming into competition with the higher grades has been continued. On the whole, quality has shown a slight improvement, the average grade for the year being 93.266, as compared with 93.158 for the previous twelve-month.

The scale of prices under the Government's guaranteed-prices scheme has had a bearing on quality, and during the present season butter-manufacturers have aimed at a finished article on which the premium above the basic price is being paid. In addition, some of the advance in quality may be attributed to improved shed, plant, and farm conditions, as well as improvements in respect of dairy factories and plant brought about through the Labour Department's financial assistance by way of subsidy.

Complaints were confined principally to feed flavours and to faulty control of neutralization of acidity in cream. The practice of using starters in buttermaking is extending, and considerable difference of opinion still exists as to the advisability of using starter in the manufacture of butter. It would appear that proper conditions of preparation and considerable experience and skill in the use of starter are necessary before the practice can be safe and success assured.

The growing number of reports from the Divisions's officers in Britain in respect of foreign matter in dairy-produce, more particularly butter, gives cause for grave concern. The matter has been taken up with dairy companies, but unless the position improves severe steps would appear justified to remove grounds for further complaint. The majority of reports received indicate carelessness rather than accident, and in properly equipped and conducted factories there should be little excuse for either.

pH TESTING OF BUTTER.

The pH testing of butter for alkalinity, which has been more thoroughly carried out during the past year, has given a clear indication to factories which were using excess neutralizer. This work, which was inaugurated prior to 1933 at Wanganui, by Mr. F. Bishop, Moisture Tester, has been developed on the colorimetric principle as suggested by him, and for the purpose of checking the accuracy of the system a potentiometer is in use at Auckland. In a number of dairy factories an appliance known as the Lovibond comparator is being used for the same purpose.

During the year 3,938 pH tests of butter were made at Auckland, 1,068 at Wellington, 162 at New Plymouth, and 34 at Castlecliff, a total of 5,202. In addition, at the Auckland grade stores 235 samples of butter were tested for iron content.

TESTING BUTTER FOR MOISTURE AND SALT CONTENT.

The Dairy Industry Act provides for a maximum moisture content of 16 per cent. in exported butter, while this is also the legal requirement in Britain in respect of imported butter. To safeguard the position each churning forwarded for grading is tested, overmoisture butter being withheld from shipment and returned for reconditioning to the dairy company concerned. During the year under review 182,690 churnings were tested, 0.31 per cent. being over the legal limit.

With regard to salt the regulations permit a range of from $1\frac{1}{2}$ per cent. to 2 per cent. Salt tests made during the year totalled 168,753, of which 0.15 did not comply with the regulation limits and accordingly were withdrawn from shipment. In a few cases, however, the shipment of butter with a salt content outside the legal range, and intended for special markets, has been permitted.

BUTTER-BOXES.

The question of supplies of butter-boxes has been an extremely difficult one. Following the decision to eliminate the peeled box in February, 1936, some dislocation in the supply of the other three types of boxes arose, and a number of adjustments had to be made.

This was followed by a reluctance on the part of dairy companies to place their orders for boxes for the 1936-37 season until the terms of purchase under the guaranteed-price scheme had been announced, and the added difficulty of getting firm quotations from the boxmakers. The latter were unable to furnish quotations owing to the uncertainty regarding labour-costs, and this led to a delay on their part in placing their orders for timber. This, combined with the abnormally wet summer, resulted in a shortage of seasoned timber being available when required, and in order to ensure the distribution of the supplies available the New Zealand Boxmakers' Association undertook this work and allocated the requirements of the creameries to the members of the association for fulfilment.

At an early stage it became apparent that the bulk of the supplies of timber required would have to be drawn from the West Coast of the South Island, and responsibility for providing the quantities needed was undertaken by the State Forest Service, which arranged for the distribution of the supplies available to the boxmakers in the North Island.

At the same time arrangements were made for the formation of a pool for all butter-boxes made in the North Island from New Zealand timbers, the administration of the pool being placed in the hands of the Dairy Board. Under this scheme the Dairy Board pays the boxmaker on a basis of the cost of the timber delivered at his box-factory, the boxes being charged up to the dairy company by the Dairy Board at the average pool price ex-box-factory plus the cost of the administration of the pool.

During the season permission was given for the export of a limited quantity of butter in imported containers (*Picea abies*)—approximately half a million—for which orders had already been placed, while further trial shipments of boxes of a number of other types were also made, these being Saranac boxes made of soft rimu timber, fibre-board boxes with wooden ends and cleats, and the Whitford box, which has a fibre-board liner to which a Saranac type of wooden covering is attached. The results of these shipments are not yet available.

In view of the complaints received regarding the development of mould on butter landing in Great Britain in the summer months of the last three years, particularly when packed in Saranac boxes, it was decided that from February onwards all butter packed in this type of box should be wrapped in Parchfoil, and an allowance of $1\frac{3}{4}$ d. per box was made by the Marketing Department to

cover the cost. (Parchfoil is a wrapping-material consisting of two thicknesses of parchment paper with a layer of aluminium foil between). While it is recognized that the use of Parchfoil will not prevent the development of mould on the box it is expected to prevent it from reaching the butter.

Consideration was given to the treatment of the box-timber with liquid mould-preventatives, but it was found that facilities for carrying out the work on a large scale were not available. Full supplies of Parchfoil could not be obtained during February, but supplies gradually increased, and by the end of March practically all Saranac boxes being received at the grading-stores were lined with this material.

As the result of the consistently favourable reports received from London regarding the wire-bound substandard box it has been decided to delete the unwired standard box from the list of those approved for the export of butter. This decision was influenced by the number of breakages of standard boxes compared with boxes of other types, the cost of wiring which would be required to prevent breakages, and the saving in timber.

Owing to the wide range of the varieties of timber suitable for cheese-crates, the same difficulties have not arisen in that connection.

WHEY BUTTER.

Gradings of whey butter totalled 1,484 tons, an increase of 76 tons over the previous year's figure of 1,412 tons. The quality still shows considerable room for improvement, and more skilled handling of the raw material is needed. Whey butter is disposed of similarly to second-grade creamery. It is used exclusively for cooking and process purposes and does not enter into the sphere of the higher-quality standard article.

CHEESE.

Some 89,996 tons of cheese came forward for grading, and of this total, 18,806 tons, or 20.90 per cent., were graded as finest, 68,927 tons, or 76.61 per cent., as first, and 2,233 tons, or 2.48 per cent., as under first.

Taken as a whole, cheese-quality for the period under review must be regarded as fairly satisfactory, showing a slight improvement over the previous year. The principal faults are still openness and mould. Starter troubles were less general, though still a major problem in connection with cheese-manufacture. Apart from openness and mould, adverse reports from our London officers relate chiefly to a lack of Cheddar character and an inclination to bitterness, with harsh, mealy bodies. Broadly summed up, however, London reports were encouraging and indicate that New Zealand cheese is well received in Britain and improving its reputation from year to year.

With regard to mould, an experiment was conducted at the Wellington grading-stores in April to endeavour to ascertain the effect of handling on mould-development, it being considered by some that rough handling of the cheese in the factories was a likely cause. The experiment gave inconclusive results, but served to indicate that if conditions in the curing and storage rooms were properly controlled mould was unlikely to penetrate even a cracked cheese.

Cheese made from pasteurized milk during the year totalled 88 per cent., while 57 per cent. were wax-coated, the comparative percentages for the preceding year being 87 and 60 respectively.

From early March onwards a large number of factories, especially in Taranaki, diverted from the manufacture of cheese to butter and casein. As this change-over has been made earlier in the season than usual the output of cheese for the dairying season as compared with previous seasons will probably be affected.

The position of a number of the smaller cheese-factories, particularly in the Manawatu and southern Hawke's Bay districts, has somewhat altered since last season. It was anticipated by those in control of some of these companies that the differential payment provided between butter and cheese, under the Government's purchase scheme, would help to consolidate the position of the smaller cheese companies. This, however, does not at present appear to be entirely the case, and if these smaller units are to continue it would appear that some adjustment may be necessary as the result of this first season's experience. The additional working-costs, which bear more heavily on cheese than on butter-factories, make the position of the smaller companies very difficult. In some of these cases factory buildings and plant are in a bad state of repair, and in need of immediate attention.

CASEIN.

New Zealand casein continues to be in keen demand on overseas markets, due to its uniformity and high quality. Casein prices, particularly toward the end of the financial year, have been very favourable, with the result that comparatively early in the season a large number of cheese-factories switched over to the manufacture of this product. It is probable that in the autumn of this year a larger number of factories were engaged in the precipitation of casein than at any previous period in our dairying history. Grading is not compulsory and though occasional gradings are carried out at various places in the North Island, Wanganui is the only centre where the service is conducted with continuity.

Casein graded during the year totalled 1,326 tons, as compared with 2,141 tons for the previous year, a decrease of 815 tons. According to Customs returns, however, exports for the year amounted to 1,185 tons, valued for Customs purposes at £218,433, the comparative figures for the previous year being 3,404 tons, valued at £163,235.

REGRADEING OF BUTTER AND CHEESE.

Rather more regrading than usual was carried out last season, the object being not so much to check the grading as to study the effect of storage on dairy-produce, with a view to judging its condition at time of delivery on the Home market.

At New Plymouth twenty-five lines of butter, representing each brand passing through the port, were held for varying periods and duly regraded. While no cheese was specially held, an even larger number of lines were re-examined prior to shipment. Special storage tests in respect of 340 boxes of butter and 109 crates of cheese were carried out at the Auckland port, each box and each crate representing a different churning and vat respectively.

Much valuable data was so gained, although the outcome of these special tests, taken as a whole, suggested no grounds for variation of present grading standards.

COOL-STORE TEMPERATURES.

Occasional checks made in previous years on the temperatures of the stores in which butter and cheese is held prior to shipment pointed to the need for a stricter supervision, with the result that throughout the past year officers of the Division have taken records of daily readings at all ports. In one or two instances it was found necessary to ask a better service from the cool-storage companies, but it can be said that conditions in this respect have shown a marked improvement in recent months, and that the provisions of the regulations with regard to holding temperatures are now being more satisfactorily complied with.

GRADING OF MILK AND CREAM.

While a strict supervision of the work of milk and cream grading at dairy factories is still found necessary, inspections indicate that in the great majority of cases this work is proceeding satisfactorily. The daily grading of milk at cheese-factories was made compulsory as from the 1st October, 1936, and up to the present no difficulties have been met with in connection with the introduction of this new procedure.

The daily delivery of cream to creameries is rapidly becoming a general practice, and, combined with cream-grading, is having a noticeably favourable effect on butter quality.

CHECK-TESTING SUPPLIERS' MILK AND CREAM SAMPLES AT DAIRY FACTORIES.

Considerably more attention was devoted to this work during the past season, and for the year ending 31st March, 1937, check-tests numbering 858 were carried out by divisional officers, as compared with 440 for the previous year. Taken as a whole, the check-testing has indicated accurate work on the part of factory-managers.

FARM DAIRY INSTRUCTION.

The number of Farm Dairy Instructors remains the same as last year—namely 39—these officers being employed by eighty-five dairy companies, whose suppliers number 36,210, of a Dominion total of 70,258. It will be seen, therefore, that little more than half of the suppliers receive the very great benefits of the services which these officers are able to render.

INSPECTION OF MILKING-MACHINES.

For the period under review notifications of 3,195 milking-machine installations were received, as compared with 2,454 for the previous year. Vending and erecting firms have evidenced a desire to co-operate with the Division and to comply with the regulations, and inspections by the Division's officers indicate very few cases of contravention of the regulations.

DAIRY-FACTORY MANAGERS' REGISTRATION BOARD.

This Board of eight members, which has been functioning since June, 1934, held four meetings during the year. A total of 714 applications were dealt with, 568 being renewal of certificate, while 146 were new applications. Of the former all were renewed, and of the latter 113 were granted certificates, ten deferred for further consideration, and fourteen applicants have been requested to sit for examination, the remaining nine being declined registration.

A further amendment to the Dairy-factory Managers Regulations, cited as Amendment No. 3, serial No. 13/1936, was gazetted on 3rd September, 1936, and came into operation the day following. The amendment relates to the granting of permission for a manager not the holder of a dual-plant certificate to continue as manager during a temporary change-over in any particular period from the article usually manufactured at the factory concerned.

The regulations provide that in the case of any contravention of the Dairy Industry Act the Board may, if it considers the breach of sufficient gravity, deregister the manager concerned. The unpleasant task of carrying out this duty fell to the Board in one instance during the year.

INSPECTION OF NEW ZEALAND DAIRY-PRODUCE IN BRITAIN.

During the year Mr. H. A. Foy, formerly Dairy Instructor with headquarters at Hamilton, went Home to assist Messrs F. H. Taylor and G. V. Were, the Division's London Inspectors. The work in connection with the examination of our dairy-produce at the London end has now assumed such dimensions as to require the full-time effort of three officers. The service rendered by the London Inspectors is of the greatest value, their duties pertaining not only to inspection and suitability, but also to containers, wrapping-materials, adjustment of complaints, both wholesale and retail, and many other phases of the business at the marketing end. The large number of reports received are valuable not merely to officers of the Division, but to dairy companies, factory-managers, and all who are directly concerned with the manufacturing business at the New Zealand end.

DAIRY LABORATORY, WALLACEVILLE.

The Division's Laboratory at Wallaceville, under the charge of Dr. G. M. Moir, has provided an increasingly useful service for routine testing of samples forwarded by factory-managers, Instructors, and Graders. During the past year the total number of samples received exceeded two thousand, which is fully double the number dealt with in the previous year. This increase is chiefly due to the very large number of butters received for bacteriological testing, and also to more samples of butter being received for chemical testing.

The testing of cheese-starters for contamination, which has been prosecuted for several years, has been allowed to lapse somewhat during the past season, but it will be desirable next season to resume the systematic testing of starters as in former years. Similar testing of butter-starters indicates that many are satisfactory, but continued efforts are necessary to insist on the improvement of those which are contaminated by careless treatment in the factory.

The bacteriological examinations of butter which were begun about eighteen months ago have been considerably extended during the past season, and samples from both Auckland and Wellington have been regularly tested. Last winter the opportunity was taken of checking the reliability of the methods by other more elaborate tests. In this way the new methods now regularly used have been placed on a firmer basis. These methods are an outstanding advance upon anything which has hitherto been attempted for ascertaining the bacteriological condition of butter, as regards both numbers and types of germs present.

The results obtained indicate that although a fair proportion of the factories maintain a satisfactory hygienic standard many are only average, and fully 20 per cent. are at some time or other unsatisfactory. In most cases this last condition is probably due not so much to visible dirt about the plant as to inadequate steam sterilizing. Some tests which have been done upon samples of pasteurized cream suggest that the bacteriological standard which has been tentatively adopted during the past season is not unduly exacting; in fact, the experience so far obtained suggests that, although only a few factories have hygienic conditions, many could achieve a distinctly higher standard in this respect.

Only a small number of samples of unsalted butter have so far been tested by these methods. Scarcely a year passes without evidence that serious contamination is the cause of the periodical failures which occur with unsalted butter. The testing of every churning of unsalted butter for bacterial content may not be practicable, but if the privilege of making unsalted butter were confined to those factories which not merely produce high-grading butter, but also maintain a high standard of bacteriological cleanliness, the risks of the unsalted-butter trade could be considerably diminished.

The laboratory has continued to test samples of factory water-supplies, particularly those used for washing butter. Although the number of waters so tested in the past season has been quite small, cases have occurred where the water was found to be causing defects in the produce. Suggestions which have been made in several cases have enabled the water-supply to be considerably improved. If time permits it is hoped to extend considerably this service to the industry during the coming season.

The principal chemical work of the laboratory during the past year has been the examination of butter for metallic contamination, which adversely affects its keeping-quality. After much careful investigation a simplified process has been devised which enables the iron content of butter to be accurately determined, starting with as little as ten grams of butter and working in the simplest glassware. In similar fashion improved methods for accurately determining the copper content of butter have been evolved and promising results obtained. As both these methods are in every way ahead of past procedures available for the purpose, a considerable number of samples have now been tested for their iron and copper content. The great majority of creamery butters have an iron content well below the maximum desirable figure of 1.5 parts per million, but in regard to copper a higher proportion of samples exceed the desirable maximum of 0.2 parts per million.

During the past season facilities provided in the Auckland testing-room have enabled some useful work to be carried on there, chiefly the pH testing of butters to assist in controlling the use of too much soda for neutralizing cream. With the co-operation of the Instructors it is hoped to eliminate the unsatisfactory neutralizing practices which prevail in some factories.

LEGISLATION.

The principal legislative measure relating to the dairy industry passed during the year was the Primary Products Marketing Act, which came into force on the 15th May, 1936.

Two amendments (Nos. 4 and 5) to the Dairy-produce General Regulations, 1933, were gazetted during the year. So many amendments have been necessary and such important changes made that it has been considered desirable to consolidate the Dairy Industry Act and the Dairy-produce General regulations, and this work is now in hand.

PROSECUTIONS.

In two cases it was found necessary to take legal action for breaches of the Dairy Industry Act. Both concerned cheese-factories, and both were brought against the factory-manager. In one case curd or inferior cheese had been incorporated in cheese of otherwise finest quality, while the other was a case where a grade other than its true grade had been assigned to milk received for cheesemaking. In both cases convictions were secured and fines imposed, while in the first-mentioned instance the manager was deregistered by the Factory Managers' Registration Board.

LABOUR DEPARTMENT SUBSIDY ON DAIRY BUILDINGS AND EQUIPMENT.

The administration of what is known as Scheme B 2, whereby financial assistance was offered by the Government to dairy companies and dairy-farmers in respect of dairy buildings and equipment was transferred during the year from the Unemployment Board to the Labour

Department. The scheme, which came into force in June, 1935, closed, so far as applications are concerned, at the end of May, 1936, and all outstanding claims are now practically cleared up.

It fell to the lot of the Division's officers to approve and pass all work carried out under the scheme. This necessitated at least two inspections in every case, and obviously the work and travelling involved was considerable. Records indicate that applications received from dairy companies totalled 367 and from dairy-farmers 5,356. The capital value of the work involved was, roughly, £600,000, while it is estimated that over £47,000 will finally have been paid out by way of subsidy.

The improvements in farm and factory conditions resulting from the financial assistance granted is likely to be an important factor in improved quality of butter and cheese.

CERTIFICATE-OF-RECORD TESTING.

A review of the certificate-of-record system for the calendar year 1936 shows a slight decrease in the number of certificates issued as compared with 1935. The total first-class certificates issued for the year was 534, and the 1935 figure 554. There was a marked falling off in the number of cows tested in the 305-day-test division, while more support was given to the yearly test than was evident last year. Four hundred and ninety cows received first-class certificates in the yearly division and forty-four in the 305-day division, as against 450 and 104 respectively for the year 1935.

Second-class certificates were issued for thirty cows during the period under review, as compared with twenty-nine for 1935.

Forty-seven third-class certificates were issued for cows qualifying in this division, as against 140 for 1935. This substantial decrease may be explained by the fact that this class which has been in operation for four seasons only was made retrospective, and all such certificates have been issued prior to 1936. It may be mentioned that the issue of third-class certificates has been discontinued from 1st January, 1937, and all cows failing to qualify for first-class certificate on subsequent calving requirements only are now being grouped in the second-class. This rearrangement was carried out upon representations from the New Zealand Dairy Breeds Federation. All third-class certificates previously issued are being replaced by certificates in the second class.

The average butterfat production for the 490 first-class yearly certificates issued in 1936 was 509 lb. This represented a decrease of 7.3 lb. over the 1935 average of 516.3 lb. fat per cow. An increase, however, was shown in average butterfat-production for the forty-four cows tested in the 305-day division, the 1936 figure 437.94 lb. being better by 20.18 lb. fat than the average of 417.76 lb. fat for 1935.

GOVERNMENT OFFICIAL HERD-TESTING.

The summary for the ninth year's operations, which is complete to 30th September, 1936, includes production figures for 1,910 cows, a decrease from the 1934-35 total of 2,058. The cows tested during the season under review were in the herds of 183 breeders, as compared with 195 herds for the preceding season. The average yield for 1,753 cows milked 180 days or more was 326.32 lb. fat from 6,726.9 lb. milk.

ORDINARY HERD-TESTING.

A total of 245,355 cows received two or more period tests under the above system during the season 1935-36, compared with 265,944 for 1934-35. The average production per cow under the classification of all cows in milk 100 days or more was 257.64 lb. fat, 237,014 cows being represented. A large measure of support received by the group system is evidenced by the following figures. Of the total cows tested 232,538 were tested by the group method, 12,079 under the association system, and 738 by the Dairy Company method.

The testing of ordinary dairy herds is now under the control of the Herd-recording Department of the New Zealand Dairy Board, who will, commencing with the current season, take over the compilation of the annual herd testing statistical review.

STAFF.

Mr. W. Grant, Dairy-produce Grader, who had been with the staff since 1904, retired on superannuation on the 16th October, 1936.

On the 3rd August, 1936, after the lapse of nine years, Mr. J. O'Dea rejoined the Division's Staff, and from the date mentioned was appointed Grader in Charge at Wellington and Supervising Grader for the North Island.

Mr. J. G. Ward, previously a Farm Dairy Instructor, was appointed a Special Inspector. The following officers were also appointed Special Inspectors: Messrs G. E. Mortimer, W. T. W. Bennitt, A. Carnie, E. M. Grant, and L. A. Webster.

The following Farm Dairy Instructors were appointed during the year: Messrs R. Old, L. C. Cooke, C. E. Foskett, and J. A. Maloney.

Mr. T. W. Hair was appointed to the staff of C.O.R. Testing Officers.

THANKS.

I desire to record my appreciation of the loyal assistance of the staff during another busy year. Thanks are also due to a number of organizations for courteous and helpful co-operation.

HORTICULTURE DIVISION.

REPORT OF J. A. CAMPBELL, DIRECTOR.

THE FRUITGROWING INDUSTRY.

Orchard operations during the 1936-37 season were considerably hampered by the changeable weather conditions experienced, particularly during the growing period.

The fruit crop varied to a considerable extent in the main commercial growing areas—some districts producing average crops—while in others both pip and stone fruit were on the light side.

In Marlborough and a portion of the Otago Central district conditions were more favourable, and good to heavy crops were secured.

Growers in the Hawke's Bay district suffered a further reverse in the form of a very heavy frost in October which practically wiped out the whole of the fruit crop, only a few orchards on the outskirts of the affected area escaping. This, following the severe damage caused by the gale in February, 1936, left many growers in a very unfortunate position financially. As a result also of this disaster all subsidiary industries in the district such as boxmaking mills, cool stores, canning factories, &c., were seriously affected. Frost relief in the nature of sustenance and a subsidy on wages paid for labour was granted to those growers who were badly hit and unable to carry on. The assistance given was much appreciated by the industry and will enable growers to pull through till next season who otherwise would have been obliged to abandon their orchards.

Frost damage to a lesser extent also took place in the Gisborne district and a portion of Central Otago and considerably reduced the fruit crop in the affected areas.

In the Motueka and Mapua districts hail damage affected the quantity of fruit suitable for export from those areas.

In most districts small fruits—gooseberries, raspberries, and strawberries—yielded good crops. The tomato crop, however, was a disappointing one, the continued unfavourable weather retarding ripening, and early frosts rendered the remaining crop useless.

The inclement weather conditions interfered to a large extent with the carrying-out of spraying operations generally and rendered the control of fungous diseases such as black-spot somewhat difficult.

Insect pests as a whole were not so prevalent as in former seasons and were more readily kept in check.

Fireblight disease was not conspicuous during the year, any slight outbreaks being promptly dealt with, and the position generally is satisfactory.

There has been a steady improvement in the general standard of orchard management, growers realizing the necessity of producing crops of good fruit at a minimum of cost.

This has become more vital in view of the increased wages now ruling and the reduction in working-hours, and growers generally will require to concentrate on not as to how much fruit they can produce, but the quantity of fruit of high quality that can be shown for the season's work.

In order to meet the higher cost of orchard labour the Government has decided to subsidize growers in cases where the average market return for fruit is below the assessed fair return, and all commercial orchardists have been notified accordingly.

The citrus industry, the youngest of our agricultural industries, is continuing to make progress, more especially in localities in the Auckland, North Auckland, and Tauranga districts, where the soil and climate are suited for the growing of citrus fruits.

The total area now planted is in the vicinity of 2,000 acres (lemons 1,400 acres and oranges 600 acres).

Good seasonable crops of lemons and oranges have been obtained and prices generally have been satisfactory for good-quality properly cured fruit.

It is considered that with the trees now in bearing and those planted in recent years coming into full production, more than sufficient lemons will be available to meet local requirements for some time to come. There is, however, plenty of room for development in regard to sweet oranges, provided the quality is satisfactory.

Growers are gradually complying with the requirements of the regulations relating to the grading and packing of lemons brought into force some eighteen months ago, and it is anticipated that before long only fruit complying with the respective standards will be found on the markets.

This is highly necessary in order that a good reputation for New Zealand citrus fruits may be built up and any prejudice that may at present exist against the local article removed.

The co-operative citrus-curing and packing shed at Kerikeri, Bay of Islands, is now practically completed and is expected to commence operations at an early date. At Tauranga the Citrus Growers' Association is at present installing an up-to-date air-conditioning plant in its store.

These improvements are a step in the right direction and should greatly assist in the orderly marketing of citrus fruits in the Dominion.

Investigations into various matters connected with the industry, such as manuring and curing, are being conducted by the Department, and others contemplated cover the processing of by-products.

The growing of passion-fruit on a commercial basis has been receiving considerable attention during recent years, more particularly in the North Auckland district. There has, however, been a falling off in the quantity of fruit produced during the past two seasons, due largely to the want of co-operation in the marketing of the produce. Another factor that has contributed to the past season's light crop is the incidence of disease, which demonstrates that it is essential for growers to carry out systematic spraying of the vines, this phase of the work having hitherto been practically neglected.

Although the plantings of new orchards during the year were fairly considerable, these were largely offset by the taking-out of trees on certain areas that had become unprofitable. The total area in commercial orchards in the Dominion, therefore, stands at approximately 27,000 acres.

During the year a Committee was appointed to investigate the marketing of fruit and vegetables in the Dominion. The Committee sat in the main centres and heard the evidence of a large number of fruitgrowers and others. A full report has been placed before the Government, and no doubt the recommendations contained therein when put into operation will assist in removing many anomalies that at present exist.

The cultivation of asparagus on a commercial basis is a matter that has been receiving attention during the year. A trial shipment forwarded recently to London carried reasonably well and realized excellent prices. In view of the considerable demand locally and the possibility of opening up an export trade both in fresh as well as canned asparagus, arrangements have been made to plant an experimental acre of land situated on the Napier lagoon reclamation, where some 6,000 acres of land of very fair quality with good road, railway, and port facilities will shortly be made available for settlement.

A conference of Orchard Instructors attached to the Division was held in Wellington during July, and many important matters connected with the work of the Division were discussed.

EXPORT OF FRUIT.

The inclement weather conditions prevailing practically throughout the Dominion during the 1936 fruit season seriously interfered with the carrying-out of orchard operations, particularly in respect to spraying, and a fairly large proportion of the apple crop was rendered unsuitable for export purposes on account of being affected by black-spot and the effects of russetting.

Considerable losses were also inflicted by the heavy gale which swept the North Island on the 2nd February, some growers losing 50 per cent. to 60 per cent. of their crop.

As a result of these unusual conditions the quantity of fruit suitable for export was considerably reduced.

The total number of cases shipped overseas was 1,228,286. Of these, 914,149 cases apples and 90,635 cases pears were consigned to Great Britain, 61,421 cases apples and 582 cases pears to the Continent, 53,993 cases apples and 2,131 cases pears to North America, 47,966 cases apples and 19,618 cases pears to Sweden, 30,000 cases apples to South America, and 7,791 cases apples to the East.

In connection with the 1936 fruit shipments, where a grower's average return is below the average rate determined by the New Zealand Fruit-export Control Board, the Government agreed to pay to the Board's central fund 50 per cent. of the shortages provided the agreed-upon rate did not exceed 9s. New Zealand currency per case c.i.f. overseas destinations and provided the fruit has been exported in accordance with Government export requirements. The liability of the Government under this arrangement not to exceed £12,500.

Various factors were responsible for the low prices received for the fruit shipped to Great Britain during the 1936 season.

Continuous cold weather experienced till well into June and the curtailing of all entertainments on account of the death of His Majesty King George V had a depressing effect on trade.

New Zealand fruit had also to compete with heavy shipments from other countries, exports of apples from Canada and the United States to the United Kingdom being nearly 50 per cent. greater than those of the previous season. Imports from South Africa and Australia were also considerably in excess of those of 1935. Very little business resulted on the Continental markets owing to the unsettled state of affairs in Europe.

The returns from other countries to which shipments were made were considered satisfactory.

Exports of apples and pears from the Dominion during the last five years are as follows:—1932, 1,596,058 cases; 1933, 1,430,513 cases; 1934, 1,574,912 cases; 1935, 1,063,420 cases; 1936, 1,228,286 cases.

The destruction of practically the whole of the fruit crop by a heavy frost in Hawke's Bay, one of the principal exporting districts, will seriously affect the quantity of fruit available for export during the 1937 season, and it is doubtful if the total shipments will reach a million cases.

In connection with the 1937 fruit shipments, the Government has guaranteed to the grower a c.i.f. return of 10s. 6d. per case (New Zealand currency) in respect of such varieties of apples and pears packed in accordance with the requirements of the export regulations for shipment to duly approved markets.

The first of this season's shipments left Wellington per s.s. "Fordsdale" on 18th February and comprised 10,538 cases apples and 28 cases pears.

LOCAL MARKETS FOR FRUIT AND VEGETABLES.

The inspection of locally-grown fruit and vegetables in shops and auction-rooms in the main marketing centres received regular attention during the year.

Reports to hand indicate that the bulk of the lines offered for sale was up to standard and well packed.

Owing to a general shortage in the fruit crop very satisfactory prices were realized for fruit of good quality. In view of the good prices ruling there was, however, a tendency on the part of some growers to market poor-grade stuff, and a number of instances of unfair packing, both of fruit and vegetables, came under notice.

No doubt the recommendations of the Fruit Marketing Committee when given effect to will go a long way towards remedying some of the present existing evils.

A shortage of oranges took place on the local markets due largely to the shipping strike on the Pacific Coast. The situation was, however, relieved by importations from other sources free of fruit-fly infection.

IMPORTED FRUIT, PLANTS, ETC.

The examination of all imported fruit, plants, bulbs, &c., was carefully carried out at the different ports of entry in the Dominion prior to being allowed entry.

The bulk of the consignments arrived in good order and condition, being clean and free from disease.

An increase on the previous year's figures is noticeable in the quantity of oranges and tomatoes from the Cook Islands, and also in respect to bananas from Samoa. Orange importations from Australia and Jamaica also show an increase.

There was a substantial increase in the number of packages of plants and bulbs imported from overseas.

Imported nuts show a decline especially in regard to almonds, supplies of which have been restricted on account of hostilities in Spain.

Several lines of walnut meat were found to be infected with the larvæ of the Indian meal-moth, and the usual action was taken in respect to these.

The fumigation of a number of consignments of imported grass-seed was carried out in accordance with the import requirements, and a considerable quantity of weevil-infested grain was similarly treated on behalf of local merchants.

FRUIT COLD STORAGE.

A matter of vital importance to the fruit industry is that of cold storage both on land and aboard ship.

Many problems affecting the keeping-qualities of fruit have been gone into during the year and a considerable amount of experimental work carried out.

A important feature is the storage of fruit on board overseas vessels, and in this connection the efficacy of various methods of dunnaging has been receiving attention. The adoption of any particular method is a matter that will require careful consideration owing to the variation of the size and depth of the holds and the different systems of refrigeration in use in the fruit-carrying ships. So far there has been very little evidence that any of the new methods tried out are any better or worse than the dunnaging practices that have been operating in the past.

Other experiments included the testing of the keeping-qualities of apples (Gravenstein) picked at different stages of maturity; incidence of bitter-pit on Cox's Orange Pippins; delayed marketing of Cox's Orange Pippin apples and Winter Cole pears; refrigerated gas-storage trial on shipboard with apples (Cox's Orange).

Local cold-storage trials dealt with the influence of fertilizer treatment on the keeping-quality of apples (four varieties); influence of oiled wraps in the control of superficial scald; copper sulphate treatment in controlling the spread of grey mould on pears; wastage in Cox's Orange Pippin apples; control of soft-scald in Jonathan apples, &c.

In response to the requests received from fruitgrowers the matter of establishing a fruit cool store in Central Otago was investigated.

Preliminary work in connection with the establishment of a precooling store and central packing-shed at Rarotonga was also carried out on behalf of the Cook Islands Department.

A comprehensive scheme of experimental work with fruit is in hand for the 1937 season. Several small consignments have already been shipped overseas, and the fruit for local storage trials is being assembled in cold storage.

INSTRUCTIONAL AND EXPERIMENTAL WORK.

Special consideration has been given to the matter of affording advice and instruction on all phases of fruit and vegetable growing and horticulture generally.

The dissemination of information in this regard is not only confined to commercial growers but is just as readily given, when required, to those who have only small areas for domestic purposes. This personal contact is very much appreciated, and the instructions given are usually followed, with the result that there has been an increasing demand for advice.

The needs of fruitgrowers and others have also been catered for by the giving of public lectures and practical demonstrations in the various Instructors' districts on matters connected with orchard management generally, instruction in the preparation of fruit for market, &c.

Of the seventy-five manurial trials which were laid down in the different fruitgrowing districts in the Dominion, fifty-five have been discontinued. The differences in the results from the various treatments which were referred to in last year's report were maintained, and in many instances became more marked. Nitrogen continued to appear to be the most important element in fruit-tree manuring.

The complete manure plot is invariably the best in all trials conducted. Carbonate of lime has given very little response except in some of the trials in the North Auckland district. The results

of the liming tests on lemons at Tauranga at the end of the first six-year period were to the effect that the "limed" plots yielded 1,298 lb. of fruit per tree, as compared with 1,161 lb. per tree from the "unlimed" plots. The difference in favour of lime is not statistically significant.

The experiments laid down three years ago to determine the effect of concentrated application of fertilizers around the trees in comparison with broadcasting methods and also the injection of fertilizers in solution into the soil have so far yielded no results. Thanks are due to the co-operating orchardists for their continued interest in the trials.

The trees in the majority of the experimental plots of East Malling pip and stone fruit-tree rootstocks established four years ago, and also those on seedling stocks commenced earlier, are making satisfactory progress and in time should provide some useful information for the benefit of orchardists. These trees generally have done better than those worked on Northern Spy stock.

No outstanding progress has been made during the year in the experimental plots of hazel nuts (*Corylus maxima*) established some four years ago.

The carrying-out of experimental work at the Research Orchard, Nelson, has been continued in co-operation with the Department of Scientific and Industrial Research. The experiments include both spraying and manurial, fruit variety tests and rootstock trials.

VITICULTURE AND WINE-MAKING.

Unseasonable weather was experienced in the majority of districts where outdoor grapes are grown, and this in conjunction with the setback to the vines as a result of salt spray damage from the cyclonic storm in February, 1936, considerably affected the yield of wine grapes.

Humid conditions in the Auckland Province, especially in the North, were favourable to the development of fungous diseases and rendered control difficult. The ravages of birds were greater than has been the case for a number of years past, probably due to a lack of their usual foods, the grapes being attacked as soon as they had formed.

Even allowing for a considerable number of vines that commenced bearing during the year it is estimated that the total quantity of wine produced from the season's vintage will not exceed 134,000 gallons. This, although in excess of that of last year, which was a poor season, is some 14,000 gallons below the returns for the year 1934-35.

Outdoor table grapes also suffered from the effects of the weather, and although a smaller crop was produced the fruit was of a better quality than that of the previous year.

Prices realized for Albany Surprise, which is the most popular outdoor table variety of grape, were considered to be satisfactory to the grower.

An extension in the planting of table grapes has taken place in the Auckland, Gisborne, Hawke's Bay, Nelson, and Otago districts.

Growers of grapes under glass appear to be well satisfied with the season's results, both crops and prices being good. Further vineries have been erected and planted with vines suitable for the indoor production of grapes.

CIDER-MAKING.

The production of commercial cider from the 1936 crop of apples is estimated at 47,000 gallons, an increase of some 1,700 gallons as compared with the previous year's figures.

TE KAUWHATA HORTICULTURAL STATION (Lower Waikato).

The continuous moist weather conditions were favourable to the growth of grass and enabled more than the usual number of stock to be pastured for fattening purposes. From the sales of live-stock, wool, and skins £401 18s. 5d. was received.

Approximately two and a half acres of scrub and wattle were cleared and sown in grass prior to being planted in vines and three and a half acres of hay harvested for stock-feeding purposes.

A late cold spring and a cool summer retarded growth in the vineyard, and this, in addition to the damage caused by the heavy storm of the previous year, resulted in the season's crop of grapes being considerably below the average. It is estimated that as a result of these unfavourable conditions the quantity of wine produced will not exceed 9,000 gallons, which is a considerable reduction on last year's figures.

There has been an increased demand for wine manufactured at the Station, the total sales for the year amounting to 15,125 gallons which realised £8,031.

Orders for vines and vine-cuttings showed an increase, and large quantities were sent out during the season to all parts of the Dominion.

The financial position of the Station is satisfactory, receipts exceeding the general working-expenses by some £3,000.

TOBACCO-CULTURE.

The total area planted in tobacco for commercial purposes during the 1936-37 season was approximately 3,776 acres. This shows an increase of about 1,000 acres as compared with the figures for the previous year, the main increase being in the Motueka district, where some 3,350 acres were cultivated. The acreage in other districts was Nelson 250 acres and Auckland 176 acres.

It is estimated there are 750 growers engaged in the industry in the Motueka district, giving work to some 3,500 persons during the major part of the season.

The weather conditions experienced were not conducive to the production of the best-quality leaf. In a portion of the Motueka area considerable damage to the crop was caused by a severe frost, and the flooding of the Motueka River rendered a large quantity of leaf valueless in a number of plantations adjacent to the river by deposits of silt, the balance of the crop being reduced from first to second- or third-grade leaf.

The tobacco crop as a whole did not grade out as high as was anticipated, and the average price obtained was somewhat lower than that ruling in previous seasons. One of the reasons of this was probably due to the fact that much of the leaf had been damaged by hail, &c., prior to harvesting.

A further experimental shipment of Nelson-grown leaf consisting of eighty-five tierces of a total quantity of 78,803 lb. was forwarded to London per m.v. "Port Hobart" in October last.

The experience gained from the previous year's consignment was of considerable value in connection with the preparation of the 1936 shipment, with the result that the leaf arrived at its destination in very good condition and the prices realized were considered to be very satisfactory.

Arrangements are in hand for the forwarding overseas of a consignment of 1937 best-quality leaf as soon as the season's crop is available.

Operations have been continued at the Pongakawa Tobacco Settlement, Bay of Plenty, where 130 acres were planted in tobacco. Owing, however, to the bulk of the settlers not proving satisfactory as tobacco-growers it is probable this settlement will be discontinued as a tobacco-producing area and utilized for other purposes.

The raising of pure strains of tobacco-seed on the experimental plot set out for the purpose at Auckland has been carried out during the year.

HOP-CULTURE.

The past season was not a favourable one for hop-growing. Wet weather conditions during the growing period had a detrimental effect, with the result that there was a considerable decrease in the quantity of hops produced in comparison with the 1935 season.

The quality of the crop was also affected by the moist conditions, there being a fairly high percentage of second-grade hops.

With the heavy moisture content a great deal of difficulty was experienced by growers both in harvesting and drying operations.

In view of the lower production it is anticipated that prices will approximate those of last year, which gave a satisfactory return to the grower.

The following figures show the quantities and values of hops exported from the Dominion during the last five years ended 31st March.

						Cwt.	Value.
1933	..	..	..	..	..	3,192	13,793
1934	..	..	..	..	..	3,872	17,734
1935	..	..	..	..	..	3,627	26,522
1936	..	..	..	..	..	3,436	22,684
1937	..	..	..	..	..	4,258	28,495

TUNG-TREES.

Reports to hand indicate that practically no further plantings of tung-trees took place during the year, and it would appear that very little success has so far been obtained with the areas already planted for commercial purposes. Adequate shelter and a reasonably good soil are necessary factors in the successful raising of tung-trees.

NEW ZEALAND INSTITUTE OF HORTICULTURE.

Good work continues to be carried out by the New Zealand Institute of Horticulture in the interests of horticulture generally. An interesting feature is the training of young men and women in all branches of this work, and several who sat for the examination were successful in gaining the diploma issued by the Institute.

The joint winners of the Loder Cup for the year 1936 were Messrs. George Simpson and John Scott Thomson, of Dunedin.

The late Lord Wakehurst (Mr. Gerald W. Loder) was greatly interested in New Zealand native trees and plants and presented this valuable cup for the purpose of "encouraging the protection and cultivation of the incomparable flora of the Dominion."

The cup was first competed for in 1929.

REGISTRATION AND INSPECTION OF NURSERIES.

All nurseries raising plants for sale as prescribed in the regulations relating to the registration of nurseries were inspected in the respective districts. The Inspectors report that the bulk of the areas are kept in good order and the quality of the plants raised well up to standard. There has been an increasing demand for nursery stock of all kinds, especially shelter-trees and ornamental shrubs.

Some 588 nurseries were registered during the year, registration fees amounting to £588. This is a slight decrease on the previous year's figures, a number of the smaller nurserymen having given up business for reasons of ill-health, &c.

ORCHARD REGISTRATION AND ORCHARD-TAX.

Changes in ownership and alterations in areas either by increase or decrease necessitated a considerable number of fresh registrations during the year.

The total number of registered orchards (orchards from which fruit is sold) in the Dominion is 6,203, comprising 2,741 taxable and 3,462 non-taxable.

Orchard-tax payable amounted to £2,266, inclusive of penalty for late payment.

The tax is not what might be termed a Government tax, but is levied on fruitgrowers at their own request for the benefit of the fruit industry generally. In this connection a portion of the tax collected is paid to the New Zealand Fruitgrowers' Federation, Ltd., (less cost of collection), and the balance to the Department of Scientific and Industrial Research to assist in the carrying-out of research work relative to the many problems connected with fruit-growing.

Fireblight-tax was levied in four commercial fruitgrowing districts during the past year, the proceeds (less collection expenses) being handed over to the Fireblight Committees concerned for purposes connected with fireblight-control in their respective districts.

THE BEEKEEPING INDUSTRY.

The 1936-37 season may be regarded as an extremely disappointing one to the majority of beekeepers. The somewhat boisterous spring prevented the bees from working the early flowering plants, consequently colonies were slow in building up to normal strength. In most districts these unsettled conditions were continuous and little or no improvement was experienced during the whole of the summer. The unusually long spells of inclement weather caused an excessive drain on the stores, necessitating a considerable amount of artificial feeding.

With the exception of the Hawke's Bay and Canterbury and a portion of the Wairarapa district, where the conditions were more favourable, resulting in good crops of honey being secured, the returns in the other commercial beekeeping localities were considerably below the average.

Taking the Dominion as a whole the season has been one of the most trying for beekeepers for many years past.

As a result of the light crop there has been a decided advance in honey-prices on the local markets, and producers will thereby be compensated to a certain extent for a poor season.

The local marketing of honey, however, is still a matter of considerable concern to a large section of beekeepers, and representations have been made to the Government with the view of bringing about an improvement.

Although the industry is in a somewhat unsettled condition signs of optimism are apparent in the number of new apiaries established during the year and the extensions that have taken place to existing ones. Numerous inquiries have also come to hand from persons desirous of taking up beekeeping as a means of livelihood.

There is still considerable scope for extending the industry, a number of areas suitable for the establishment of apiaries being still available in different parts of the Dominion. Additional areas of country which are being brought into cultivation by irrigation and which hitherto were unproductive from a beekeeper's standpoint are also likely to benefit honey-producers.

The inspection of apiaries has been carried out as far as it has been possible with the present available staff, and reports to hand indicate that disease is being satisfactorily controlled by the bulk of commercial beekeepers.

There is no doubt, however, that the present districts are too unwieldly for the proper carrying-out of inspection work, and a number of requests have come to hand from Beekeepers' Associations asking that further assistance be provided in order that a closer inspection for disease may be made possible.

Requests for information and advice on the various phases of beekeeping have been met by correspondence and also by practical demonstrations and lectures given by the Instructors during the year. As a rule full advantage is taken both by experienced beekeepers and others of the opportunity thus afforded to gain further knowledge on apiary work.

The grading of honey for export was carried out at the various grading-stores in accordance with the standards fixed by the New Zealand Honey Control Board, the total quantity graded being 9,049 cases, which was a slight decrease on the previous year's figures.

Quantities and values of honey exported from the Dominion during the last five years ended 31st March, are as follows :—

							Cwt.	Value. £
1933	..	..	..	..	..	..	2,005	7,014
1934	..	..	..	..	..	..	7,342	23,784
1935	..	..	..	..	..	..	5,427	17,844
1936	..	..	..	..	..	..	10,446	34,258
1937	..	..	..	..	..	..	7,774	24,658

APIARY REGISTRATIONS.

A number of new apiary registrations were received during the year: changes of ownership and removals to fresh locations were also fairly considerable.

The total number of registered beekeepers now recorded is 7,433, representing a total of some 125,573 colonies of bees.

STAFF.

I have to thank the staff of the Division as a whole for the loyal and efficient service rendered during another busy year.

It is with deep regret that I have to record the death during the year of Mr. H. F. Frost, Orchard Instructor, Masterton.

Mr. Frost had served nearly twenty years in the Department and was a popular and conscientious officer.

CHEMISTRY SECTION.

REPORT OF R. E. R. GRIMMETT, M.Sc., F.N.Z.I.C., CHIEF CHEMIST.

The past year has been one of important changes in the Chemistry Section. Of these the most notable was the retirement on superannuation of the Chief Chemist, Mr. B. C. Aston, F.I.C., F.R.S.N.Z., Hector Medallist of the Royal Society of New Zealand, who was the first Chemist appointed to the Department of Agriculture and under whom the Section has developed from its beginnings in 1899.

The contributions of Mr. Aston to agricultural chemistry in New Zealand have been varied, and in some cases of such outstanding importance as to make his name familiar to chemists all over the world.

Among the best known of Aston's researches are the isolation and identification of the poisonous principle of the tutu, tutin, and the poisonous principles of the karaka (Karakin and Corynocarpin), both in collaboration with Easterfield; the discovery and isolation of the alkaloids of the pukatea; the monumental work extending over thirty years leading to the recognition that the widespread and severe disease of ruminants on the pumice lands known as "bush sickness" is due to a deficiency of one or more of the minor elements, and the introduction of an economical cure in the form of a lick containing limonite which has made possible the rehabilitation of thousands of acres of abandoned farm lands and the settlement of new areas. Mr. Aston also directed the pioneer work of the Chemistry Section in carrying out preliminary soil surveys, and more detailed surveys of estuarial and other tidal mudflats in connection with reclamation projects; and initiated and controlled much of the investigation into the mineral contents of pasture in connection with the health of live-stock, undertaken as part of the Empire Marketing Board's scheme of co-operative research. Among the latter may be mentioned the iodine survey of New Zealand live-stock, and surveys of the pastures of Wairarapa, Taranaki, Waikato, Bay of Plenty, Central Otago, and part of Southland, from the point of view of nutritive value and content of essential minerals in relation to stock-production and stock ailments.

Some reorganization of the staff and of the scope of the work has been carried out.

The Fairlie Terrace Laboratory undertakes soil and fertilizer analyses. Analyses of plant and animal tissues and products in connection with crop-production and utilization and animal-nutrition problems are the functions of the laboratory situated in the Public Works building, while most of the general work of the main laboratory has been transferred to rooms in the adjacent Public Health building.

I am glad to record my appreciation of the enterprise and spirit of co-operation shown by all members of the staff in carrying out these removals with a minimum of dislocation in the work of the section.

Four of the staff are on study leave in Great Britain—Miss E. M. Mason has carried out at the Rowett Institute, Aberdeen, some extremely difficult and important work for the British Medical Council in connection with the testing of analytical methods for the determination of iodine in the minute amounts present in foodstuffs and other materials; Mr. E. B. Davies is studying methods of soil analysis, soil microbiology, and other aspects of soil research at the Macaulay Institute, Aberdeen; Mr. F. B. Shorland is taking advantage of a scholarship to study the composition of fish and other animal oils of New Zealand origin at Liverpool University; while Mr. R. J. McIlroy is investigating the chemical nature of the components of fibres, especially New Zealand flax (*Phormium tenax*).

During the year the Inspector of Fertilizers was transferred to the Fields Division.

Close co-operation is being maintained with the Cawthron Institute, research officers of other organizations, and the divisions of the Department.

DEFICIENCY DISEASES OF LIVE-STOCK.

Bush Sickness.—Important progress in the investigation of this stock ailment has been made during the year. The experiments recorded in last annual report on the feeding of limonites from various sources, cobalt, zinc, and purified iron salts to sheep at Atiamuri have been concluded and the results embodied in two papers published in the *Journal of Science and Technology*—"Trace Elements in relation to Bush Sickness," by Miss E. M. Wall, and "Cobalt Content of Limonites used in the Treatment of Bush Sickness," by K. J. McNaught. The results of these experiments provide evidence that the chief factor in the causation of bush sickness is a deficiency of cobalt. Taken in conjunction with the similar conclusions reached independently by research workers in Western Australia and at the Cawthron Institute, the evidence becomes practically conclusive. There is still doubt as to whether some part is played by other "trace" elements, notably nickel and zinc, and it may be that the provision of easily soluble iron is also an advantage. Experiments designed to throw light on some of these points are being continued in the Rotorua and Atiamuri districts.

In connection with experiments instituted at Mamaku State Farm by the Officer in Charge, Veterinary Laboratory, cobalt is being determined periodically in pastures top-dressed with limonite, as well as in others not top-dressed, and in organs from control sheep and sheep fed with cobalt-lick.

Meanwhile commercial supplies of limonite intended for stock consumption are being analysed periodically for cobalt to ensure that they are satisfactory in this respect. Surveys of the deposits at Okaihau and Ruatangata have shown that the different seams or irregular masses vary greatly in cobalt content, but that by selection of the ore the resultant ground product may be maintained at a level of at least 100 parts per million of cobalt. Material of this standard has proved efficacious throughout the "bush sick" area. Combined with equal parts of salt it makes a lick of good consistency and attractive to stock. The colouring-power of the limonite helps the farmer to detect which animals are taking the lick by the staining of the hair of their faces. A number of trace elements are present in these limonites and may reinforce the action of the cobalt. There is little or no danger resulting from the animals consuming quantities in excess of their requirements. It appears, therefore, that the use of limonite possesses advantages over the use of a pure cobalt salt combined only with common salt. To some extent its use may be displaced by top-dressing with fertilizers containing cobalt, but salt-licks are beneficial to stock on most classes of country, and the addition of limonite to the salt even in districts not considered "bush sick" may be advantageous and entails very little extra labour or expense.

Samples of the deposit of soft limonite at Maketu, Bay of Plenty, have been analysed and found to contain only 1.3 and 3.6 parts per million of cobalt. This figure was considered too low to warrant the expense of feeding trials.

Border-line Bush-sick Areas.—At the request of the Arohena Branch of the Farmers' Union a visit was paid to that district. Soil and pasture conditions were found to be very similar to those in the neighbouring Ngaroma district, the soils being silts and sandy silts.

Evidence is accumulating that much of the area of pumice-covered hills to the north of Hawke's Bay and east of the Huia Range is slightly affected with bush sickness. Only sheep develop marked symptoms, and where tried, limonite lick has proved very beneficial. It is anticipated that farmers throughout this area would derive much profit from the liberal use of limonite and salt as a stock lick and that the sheep and cattle carrying capacity of the district as a whole could be greatly increased thereby.

Cobalt in Foodstuffs.—The demonstration that bush sickness is connected with a deficiency of cobalt has raised the question whether it is possible to prove by experiments on small animals that this element is essential in animal nutrition. In conjunction with the Research Officer in Animal Nutrition at Wallaceville, an endeavour is being made to select a diet of purified foodstuffs extremely low in cobalt. If this endeavour be successful feeding experiments on rats will be carried out at the Veterinary Laboratory. A number of samples of foodstuffs, both in their original condition and after special purification, have been analysed for cobalt content. Although very low figures for cobalt have been found on a number of these foodstuffs there are still some difficulties to be surmounted before the experiments can be commenced with reasonable prospect of success. Some of the figures found which may be of interest are as follows (average cobalt parts per million dry weight): Butter, 0.013; lard, 0.007; castor sugar, 0.010; cod-liver oil, 0.004; wheat-germ oil, 0.007; corn starch, 0.003; casein, 0.011; dried yeast, 0.038.

Iodine Survey of New Zealand Live-stock.—The third of the series of papers under this title, dealing with the Canterbury Province, by Mason and Waters, has been published in the *Transactions of the Royal Society of New Zealand*.

The analyses of all the glands collected has now been practically completed, and the results for the remaining districts are in course of preparation for publication. Glands are still being received in connection with lick experiments in Southland and occasional outbreaks of goitre in farm stock. One such occurrence recently reported was among sheep on a farm on peaty country near Orini in the Waikato. The only general tendency towards low iodine in glands from the Auckland Province previously noted was also on farms in the same locality.

General.—A paper was read to the Sheep Breeders' Conference at Massey College and subsequently published in the report of the proceedings entitled "Deficiency Diseases and Composition and Uses of Stock Licks."

Bureau of Animal Nutrition.—Replies were secured from the various research organizations in New Zealand dealing with animal nutrition to a questionnaire sent out by the Bureau of Animal Nutrition asking for a summary of such work in progress in New Zealand, and were compiled and transmitted for publication by the Bureau.

The Auckland meeting of the Australian and New Zealand Association for the Advancement of Science provided an opportunity for meeting many overseas delegates, especially from Australia, who are working on problems of animal nutrition akin to those found in New Zealand. Many useful discussions were held, and a paper was read entitled "Notes on the Toxicology, Methods of Estimation, and Biochemistry of Zinc," which has been the means of stimulating interest in this subject.

SUSPECTED MINERAL DEFICIENCIES CONNECTED WITH PLANT DISEASES.

Zinc-deficiency (Chlorosis of Citrus and other Trees).—It has recently been found by a number of investigators in the United States, Australia, and elsewhere that certain types of chlorosis, or mottling in citrus and other fruit-trees, are connected with zinc deficiency in the soils on which the trees are growing and are curable by applications of zinc salts either in a spray or to the soil. In view of the occurrence of chlorosis in certain citrus orchards in New Zealand an investigation is being made jointly by the Department of Scientific and Industrial Research and the Horticulture Division of the Department of Agriculture into the possibility of this chlorosis being connected with zinc deficiency. A large number of samples of chlorotic and

healthy leaves have been collected and are being analysed for zinc content. Already there are indications that chlorotic leaves from the Tauranga District are significantly lower in zinc than healthy leaves, but the work is still in the preliminary stages.

Samples of cocoa leaves from trees affected with "die-back" collected by the Director of the Soil Survey Division of the Department of Scientific and Industrial Research during his recent visit to Samoa, were also analysed for zinc. No deficiency of this element was apparent, the leaves ranging from 50 to 80 parts of zinc per million dry weight.

SOILS.

Napier Harbour Reclamation.—Early in 1936 the area of raised mudflat to the south of the main dewatering channel was permanently drained through the operation of the pumps installed by the Public Works Department. During April a representative series of samples of soil were collected from this dewatered area and analysed for water-soluble constituents. In August, after a fairly heavy winter rainfall, a second complete series of samples was collected from the same locations. It was found that a very considerable reduction of salt content had taken place, those soils with the coarsest texture naturally showing the greatest reductions. Ploughing, which in a number of cases had been done between the first and second samplings, was shown to have no influence on the amount of salt leached from the soil (ploughing was necessary in many instances owing to the rapid spread of tall fescue). Much of the area had dropped in content of sodium chloride to the vicinity of 0.1 per cent. Calculated on a 9 in. depth of soil, in certain cases as much as 9 tons of salt per acre had been removed from the soil in four months. Certain selected samples were submitted to detailed chemical and mechanical analyses.

A series of soils from the Napier airport were analysed in connection with the grassing of this reclaimed area, only a small portion of which was found to have a high salt content.

Lyttelton Harbour.—Soil from some reclaimed land which it was proposed to grass contained 4.1 per cent. of sodium chloride and 0.6 per cent. of magnesium sulphate and had a pH of 8.2. It was considered advisable to defer sowing grass until drainage had reduced the salt content.

General.—A white incrustation in a tomato greenhouse at Greenmeadows, which had given rise to some concern, was found to be chiefly carbonate of lime. This was probably due to long continued use of lime and superphosphate under conditions of low leaching and high evaporation.

In connection with wheat and barley manurial trials conducted by the Crop Experimentalist a number of nitrate determinations were made on the soils.

A number of samples of soil from field trials for pasture response to liming have been collected by Fields Division officers. Determinations are being made of pH, lime requirement, and percentage base and lime saturation. These figures and the graphs drawn therefrom will be compared with the field responses in an endeavour to select or evolve a simple laboratory method enabling the behaviour of soils on liming to be predicted with a reasonable degree of accuracy.

About a dozen soils from various parts of New Zealand previously analysed and found to have a clay content of over 44 per cent. were sent to Mr. R. L. James, of Lincoln College, for experiments on methods of mechanical analysis of soils.

FERTILIZERS.

Besides routine analysis of fertilizers (see report of Inspector of Fertilizers) the following samples of a special nature may be noted:—

Samples of reverted phosphate and borated reverted superphosphate were examined in connection with seed-germination injury. Some free carbonate of lime and free acid were present in both cases. The borated basic superphosphate contained 0.81 per cent. of free boric acid, equivalent to half the borax which had been added and which had doubtless been liberated by displacement with phosphoric acid either free or as unreverted mono-calcium phosphate.

A blast furnace slag from New South Wales was found to consist principally of silicates of lime, iron, and alumina, with only a trace of phosphoric acid.

Waste from a flock-mill had a composition similar to that of English shoddy and doubtless could be similarly used as a nitrogenous fertilizer.

Samples of a synthetic basic slag made by a fusion process have been analysed and found to contain about 15 per cent. of phosphoric acid, almost wholly soluble in 2-per-cent. citric acid.

An expensive proprietary mixture claimed to have remarkable powers of promoting plant-growth was found to consist of a very dilute solution of sodium phosphate and ammonia, together with some soluble organic matter resembling rubber latex.

Limestones.

The routine testing of commercial ground limestones has been continued and is being extended to cover the majority of sources of supply to the farmer.

Difficulty has been experienced by some companies operating in districts where supplies of high-grade limestone are not readily available in maintaining a satisfactory quality in their output. Constant analytical checking and departmental representations have usually resulted in improvement.

Attention is again drawn to certain cases where ground shells have been sold under the description "burnt shell" or "burnt lime." Samples analysed have usually contained only traces of burnt lime in the form of calcium oxide or calcium hydroxide. Evidently some heating or slight burning of the shell is practised in order to facilitate grinding, but is quite insufficient to convert the carbonate into oxide.

TOXICOLOGICAL.

A further case of suspected mangold poisoning of pigs has been investigated (see last annual report). The mangels consumed were found to contain nitrate equal to 0.56 per cent. of potassium nitrate and oxalate equal to 0.12 per cent. sodium oxalate. The mangels had been pitted for one week only. Post-mortem examination by the Veterinarian showed considerable amounts of blood in both sides of the heart and excess of serum in the belly cavity and chest in all cases.

Arsenic was found in appreciable amounts in specimens of the stomachs and ingesta of some eight cows believed to have been poisoned by eating vegetation in a paddock where blackberries had been sprayed with an arsenical weed-killer. Attention was drawn to the danger of carelessness in the use of such toxic materials.

In a case of mortality in calves, lead in quantity was found in the stomach contents. The animals were found to have been licking an old red-lead paint-tin.

Hedge-cuttings identified as English yew were almost certainly the cause of the death of a number of cows in the Taihape district.

Work on the toxicology of zinc in connection with suspected zinc poisoning of pigs has been continued in collaboration with Wallaceville Veterinary Laboratory. Feeding trials with young pigs under controlled conditions using pure zinc lactate showed that growth was retarded, and a characteristic "non specific" arthritis produced together with other symptoms. Analyses disclosed exceptionally high contents of zinc in the affected joints, and in liver and kidney. No significant storage of zinc occurred in the muscles. Further experiments to determine the approximate level of zinc consumption required to produce distinct effects have been commenced. An account of this work was published in the *New Zealand Journal of Agriculture* for April, 1937.

Experimental Lead Poisoning in Rats.—In connection with experiments carried out by the Research Officer in Animal Nutrition at Wallaceville to determine the effect on bones, teeth, and other organs of rats fed with varying levels of lead acetate, a number of analyses of rat organs for lead content were performed after the rats had been subject to post-mortem examination.

STOCK-LICKS, FOODS, AND MEDICINES.

Appointments of Analysts under the Stock Remedies Act have now been made.

Several pig-meals have been analysed and found to be of reasonably good composition, but priced excessively high.

A sample of cocoa-bean-husk meal for use in feeding pigs contained 0.48 per cent. of theobromine. Otherwise its composition was similar to that reported in the literature.

In connection with a proposal to import manioc-meal for pig-feeding a sample was analysed and contained 80 per cent. of carbohydrate and only 1.5 per cent. protein. It could not, therefore, replace meat-meal.

SAMPLES FROM FIELDS DIVISION EXPERIMENTAL TRIALS.

Pastures.—Regular determinations of dry weights of samples of pastures from mowing trials on limed and other plots at Ruakura have been undertaken for the Crop Experimentalist.

Sugar-beet Trials.—A large number of trials with different varieties of sugar beets under varying soil and climatic conditions have been laid down by the Fields Division during the past year in various parts of New Zealand suitable to this crop. To obtain the maximum amount of information from these trials it was decided to carry out a complete survey for sugar content in addition to the other data obtained by the Fields Division officers. Practically full-time services of one analyst have been made available for this work which is now in progress.

Artificially dried Grass.—Among other data the carotene content of samples from Ruakura farm was determined and found to range from 23.5 to 46.5 mgm. per 100 gm. dry matter.

MISCELLANEOUS.

Two samples of butter were submitted for official check analysis in connection with a projected prosecution under the Dairy Industries Act.

Several proprietary weed-killers have been analysed. In one case the material contained from 70 per cent. to 85 per cent. of sodium chloride, being very variable in composition, and contained only very small quantities of sodium chlorate or other chemicals generally recognized as active weed-killers.

Borax Treatment of Lemons.—Difficulty experienced in a lemon-curing plant owing to the formation of sludge in a borax dipping solution contained in a new concrete bath and resulting in an objectionable white deposit on the lemons was found to be due to chemical action between the hot borax solution and the cement. The flocculent white precipitate was found to consist of calcium borate plus some free boric acid. On continued use of the bath and removal of the sludge corrosion gradually ceased, but it was recommended that metal baths should be used in future installations.

Pampas-grass.—Interest is still being maintained in this subject, and a quantity of seed heads have been collected by the Fields Officer at Whangarei for threshing in the laboratory.

Denaturing of Sugar used for Bee-feeding.—In order to permit sugar for winter feeding of bees to be imported under specially favourable Customs conditions it was recommended that a very small quantity of methyl-violet be added to the sugar to render it objectionable for human consumption. Trials carried out by the Apiarist showed that sugar treated in this manner had no unfavourable effect on the bees.

Branding-fluid.—Damage to sheep-pelts due to irritation set up by the use of a branding preparation led to an analysis to discover whether any harmful substances were present. The preparation was found to consist principally of rosin oil and no corrosive substance could be detected. The possibility that carcinogenic agents might be present could not be ruled out.

Standards Institute.—During the year I was appointed to represent the Department on the Chemical Divisional Committee of the New Zealand Standards Institute and have attended all the meetings so far held. Many specifications of a more or less routine nature affecting apparatus or methods used in agricultural chemistry have been considered in detail and a number of British Standards adopted as New Zealand Standards. In addition, a number of draft standards directly concerned with the analysis or composition of primary products have received very careful consideration and have been circulated to all interested parties. The possibility of introducing standards for meat-meals, pig-meals, and pollards to suit the requirements of the pig and poultry industries without unduly interfering with existing manufacturing practice is being explored. As a preliminary step a representative series of samples of these materials as offered for sale on the New Zealand market have been collected and are in course of analysis.

Routine testing of meat-marking fluids, cattle-dips, and preparation of glass-marking ink for Government Departments have been continued.

CHEMICAL CONTROL OF RAGWORT.

An extensive series of experiments have been carried out by Mr. F. B. Thompson, using principally individual plants grown in garden soil, to determine the relative toxicity to ragwort of various chemicals, and of various strengths, methods of application, and modifications in pH of sodium chlorate solutions. The minimum toxic dose of sodium chlorate for a ragwort plant of twelve to sixteen leaves covering a total ground area of 40 square inches to 60 square inches and not showing a flower stem was determined to be in the vicinity of 0.1 gm.

The information gained from these experiments is being co-ordinated with that of other workers on the problem of ragwort control, through the agency of the committee set up and operating under the direction of Dr. H. H. Allen, Botanist of the Plant Research Station.

SAMPLES RECEIVED FOR ANALYSIS DURING THE YEAR.

Soils	498	Bloods	67
Limes	129	Fertilizers	40
Dips	17	Leaves for zinc deficiency	32
Licks and medicines	4	Sugar beet	31
Thyroids	27	Pasture samples, Fields Division Plots	182
Waters	16	Pastures	12
Toxicological specimens	261	Miscellaneous	67
Limonites	65		
Stock foods	26		
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