1938.

NEW ZEALAND.

DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT FOR 1937–38.

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

Office of Minister of Agriculture,
Wellington, New Zealand, 16th July, 1938.

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, 1938.

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 quality of the Dominion's agricultural products, and once again the report shows that progress has been made in several important directions.

It has been my policy since assuming office to build up the advisory services of the Department rather than promote fresh regulations and increase the inspectorial work. I realize that regulatory action is often necessary, but guidance and instruction are more potent forces in the furtherance of agricultural and pastoral efficiency. Wherever possible I have also promoted the establishment of farmers' advisory committees to work in conjunction with departmental officers in different projects. I regard this procedure as a fixed policy of the Department.

During last autumn a disastrous outbreak of facial eczema in cattle and sheep occurred in a number of districts of the North Island, being particularly severe in the Waikato. Warnings of a possibility of an outbreak were published in the *Journal of Agriculture* in February last, and during the currency of the epidemic control advice was made available to farmers by personal contact, the radio, and the press. In the work of alleviating the position the departmental officers received invaluable aid from a strong committee of Waikato farmers, who are now represented on the Committee of Management which has been set up to direct a long-term programme of research and experiment. The investigations will be carried out at Ruakura Farm and out-stations in the Waikato, the Chemistry Laboratory of the Department of Agriculture, Wellington, the Wallaceville Veterinary Laboratory, and the Plant Research Station at Palmerston North. Studies will also be made

of farm practice on both affected and unaffected areas. The Government has voted over £10,000 for this work, which is the largest single investigation ever undertaken by the Department of Agriculture, and further amounts may be necessary for some years to come. Loans are being made under certain conditions to farmers who require fresh stock to replace losses incurred during the outbreak.

Following on the report of Dr. G. J. Hucker, of the New York State Agricultural Experiment Station, on mastitis among dairy cows, the Department is collaborating with the Dairy Board and the Herd-testing Federation on a system of control, and arrangements have been made for the Dairy Board and the Government to contribute £4,000 each to cover the cost of the work in the forthcoming season. Extensive testing for mastitis will be carried out each month by the Herd-testing Federation on every herd under its control, and testing sets are also being made available to farmers who wish to apply the tests themselves. It is hoped that the records collected will form the basis of farm and herd management in connection with this disease.

As indicated in the report of the Acting Director-General, increased attention is being paid to the problems of animal husbandry. Extensions costing over £15,000 are being made to the Wallaceville Veterinary Laboratory, and additional research and field officers are being appointed to the Live-stock Division of the Department. Research and administrative facilities are also provided at Ruakura. One of the obstacles encountered in the proposals for strengthening this division is the difficulty of securing trained men, and the question of establishing a veterinary school in New Zealand may have to be considered by the Government. At present a number of students are being trained in Australia under a bursary system, and their services will soon be available to the Department.

During the year the Department, in co-operation with the county authorities, instituted a campaign against ragwort in the affected districts of the North Island. The cost included £74,000 in wages and material and £13,000 in subsidies on sodium chlorate. The continuance of the scheme for the coming year is under consideration. Ragwort research is also being carried out at Ruakura.

The Government has been able to ensure adequate supplies of superphosphates for top-dressing whilst maintaining the price at £3 16s. per ton retail, and has met the persistent and warranted request that farmers' organizations and dairy companies be placed on the merchants' lists. This means a rebate of 4s. 6d. per ton. For the year 1937–38 the Government has subsidized the carriage of fertilizers to the extent of £189,626, and the subsidy on farm-produce freights has amounted to £58,329 during the same period.

Plans have been completed for the inauguration of a system of farm-dairy instruction on a national basis. Up to the present thirty-eight farm-dairy instructors have been employed by the Department and paid proportionately by the dairy companies and the Government. The Government's costs have been approximately £9,000 per annum. Under the national scheme the total cost will be between £46,000 and £47,000. The industry will bear 60 per cent. of this amount and the Government will find 40 per cent. The scheme provides for the appointment of seventy-seven officers, thirty-five of whom will be new appointees.

In May of this year, accompanied by the Director-General of Agriculture (Mr. A. H. Cockayne), I attended the seventh meeting of the Australian Agricultural Council at Canberra. This Council is composed of the Ministers of Agriculture of the different States, under the chairmanship of the Federal Minister of Commerce. I wish to record my high appreciation of the courtesy of the Commonwealth Government in inviting the New Zealand Minister to participate in these deliberations, which afforded a unique opportunity of obtaining an understanding of the problems exercising the minds of the State and Federal authorities. My admiration of the manner in which Ministers and departmental officers sought harmoniously to solve these problems was unbounded. Many of the matters discussed affected New Zealand either directly or indirectly, and Mr. Cockayne and I offered the fullest co-operation in all measures likely to promote the common welfare.

I took the opportunity while in Australia of visiting country districts of New South Wales, Victoria, and South Australia, and research institutions such as the Waite Institute at Adelaide, the Werribee Experiment Station near Melbourne, and Hawkesbury Agricultural College, the Sydney Veterinary School, and the Glenfield Veterinary Research Station in New South Wales. By the excellence of the facilities afforded me I was enabled to form some conception of the tremendous potentialities of the Australian Continent, and an appreciation of the very competent way in which the resources of that great country are being developed. Australia will in future be a formidable rival of New Zealand in certain lines of primary production in which our Dominion has enjoyed pre-eminence, but I am convinced that the two countries have so many interests in common that competition must be accompanied by co-operation, both in marketing our produce and in the solution of production problems of similar origin. The interchange of information and ideas will receive every encouragement from my Department, and I hope that it will be possible in some cases to have this effected by temporary loans of specialist officers.

The accompanying statement by the Acting Director-General of Agriculture and the reports of the heads of the various Divisions of the Department cover a wide range of subjects. The staff of the Department 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 THE ACTING DIRECTOR-GENERAL.

Wellington, 15th July, 1938.

THE HON. THE MINISTER OF AGRICULTURE,—

Herewith is appended the annual report of the Department of Agriculture, describing in detail the various activities carried out during the financial year ended 31st March, 1938. These activities have again shown an increase, and in many directions gratifying achievements have been recorded, but there are some features about our agricultural and pastoral industries which call for greater investigational and advisory services if the progress in the utilization of our land resources is to be efficiently maintained. In this report it is proposed to deal with some of the salient problems confronting us.

The discovery in 1882 that dairy produce and meat could be successfully shipped to the consuming markets of the world in a frozen state shaped the destiny of New Zealand farming. The Dominion became a producer and an exporter of an ever-increasing volume of animal products. Perhaps in no other country have soil and climate been more tractable to the industry of man, and since the door of opportunity was opened by refrigeration the development of live-stock farming has been phenomenal. However, we have now reached a stage in intensification when the increases in our live-stock production have raised problems of animal husbandry which must receive greater attention than has been paid to them in the past. The losses in our flocks and herds are too serious to be disregarded.

Up to 1900 the main feature of land-development in New Zealand was extensive settlement on large holdings and farming on an extensive scale, but with the turn of the century an increasing demand for land became apparent with a corresponding intensification of farming practice. With the development of the dairy industry there was a general trend towards the subdivision of Crown lands and large private holdings into family farms. This movement was accelerated by the graduated land-tax and a liberal supply of capital from the State to intending settlers. The war brought a quiescent period, but immediately after the cessation of hostilities there was a pressing demand for land at inflated values. The pressure of financial commitments, both private and public, necessitated increased production. Despite a certain amount of migration, labour continued to be scarce. This factor stimulated the demand for labour-saving devices. Rapid development of pasture-production, through the sowing of superior strains of grasses and clovers, the more enlightened use of artificial fertilizers, and the improvement of live-stock from the production angle all contributed towards an expansion of production. Substantial areas of our farm lands deteriorated through mismanagement, inadequate resources for development, or overwhelming financial commitments, but advances in farming technique raised the carrying-capacity of the remaining areas, and up to the present the losses through land going out of production have been more than offset by increased efficiency in the exploitation of farms on which the fertility of the soil as a producer of pasture has not been impaired.

The following table, showing the totals of stock, the areas occupied, and the area under grass in New Zealand at the opening of the present century, the first post-war year, and 1936–37 (the latest figures available), illustrate strikingly the increases in the stock-carrying capacity of New Zealand pastures:—

Season.	Total Cows in Milk or Dry at 31st January.	Total Cattle at 31st January.	Total Sheep and Lambs at 30th April.	Breeding-ewes at 30th April.	Total Area occupied.	Total Area in Grass (Smoothed Estimate), sown, Native or Tussock.
1901–02	381,491	1,361,784	20,342,727	9,610,149	35,507,889	28,412,100
1919–20	903,454	3,139,223	23,919,970	11,569,675	43,473,079	30,813,300
1936–37	1,805,405	4,389,101	31,305,818	19,332,077	43,199,893	31,697,600

NOTE.—Before 1914–15 the tussock and native grass areas were included in the total unproductive area, and the estimation for 1901–2 has been obtained by taking "straight-line" trend back to that date.

There are still some 14,000,000 acres of occupied land covered with tussock and other native grasses, and deterioration has been serious on a percentage of this area. Despite losses in fertility through erosion and other causes of areas which were once sown in grass it will be seen that the best of our grasslands to-day are more thickly populated by stock than ever they have been before. Even with the increasing density of our stock over our high-producing areas there is no immediate likelihood of a shortage in the quantity of feed available, but equal confidence cannot be expressed in regard to quality of the feed-supply, management of heavily concentrated stock, or the principles employed in the breeding of some of our farm animals. It is not implied that we are radically astray in any of these factors in live-stock farming, but there are wide gaps in our knowledge, and until these gaps are closed and annual stock losses reduced it is essential that we maintain a critical attitude.

In his annual report last year, the Director-General made the following observations:—

> "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 the 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 the position should be rectified. In the dairy industry alone a reduction in the replacement of stock lost through disease to a satisfactory low percentage would reduce dairy costs, or rather raise labour-unit efficiency to a point where fertilizer-costs, the main 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."

Since those paragraphs were written the need for intensified investigation, both into disease and on the positive side of maintaining our flocks and herds in a healthy condition, has become even more urgent. The outbreak of so-called facial eczema in various parts of the North Island, and the heavy mortality among sheep in Canterbury, have focused attention on specific problems which are being specially investigated, but there are a number of other problems, not individually as pressing but serious collectively, which must also receive immediate attention. Perhaps the greatest of these is animal nutrition generally, as this factor enters into a number of our present live-stock troubles, including facial eczema. This problem in relation to New Zealand pastures in different seasons or in various stages of growth or in relation to hay and silage or the common supplementary crops has yet to be thoroughly investigated.

Generally, the greater the effort towards the breeding of animals of high production, the greater is the problem of nutrition, but because of the abundance of feed, little attention has been paid to this aspect of animal husbandry. The quantitative production of feed has given rise to uneasiness only in abnormal seasons and in certain districts, but it has been taken for granted that quantity and quality have run parallel. This is quite understandable in a country where stock are not housed in the winter months and the farm is capable of supplying in bulk at least the fodder required to carry stock throughout the year. Seasonal changes in pastures have not been subject to comprehensive analyses from a nutritional viewpoint in the same way as studies have been made of the composition of artificial foodstuffs which are needed to supplement farm-grown fodder in countries with less favourable climatic conditions. But the time has arrived when this work must be done on a scale in keeping with the importance of animal-production in the Dominion.

More and more emphasis is being laid on the milk-producing animal, whether it be the cow, the ewe, or the sow, and, although our best pastures have admirable milk-producing qualities, we cannot be equally certain that they supply sufficient nutritional support to our principal farm animals at various stages of their career. For example, if the progeny of our breeding-stock is to be constitutionally vigorous and the vitality of breeding-stock maintained, it may be necessary to revise the feeding procedure now generally practised. It is unfortunate that there is a tendency to neglect animals not in production, and when the period of gestation is in the winter this neglect frequently results in malnutrition, affecting both mother and

progeny. The care of calves after weaning is not always sufficient to maintain healthy growth. In some cases the faulty pasturing of ewes and lambs has led to avoidable mortality, and in the pig industry there has been widespread neglect of sow and litter. Basically the problem from the nutritional angle is the measurement of the requirements of the various types of our stock population in relation to the common feeding practices now operating in the Dominion.

Coincident with the problem of nutrition, we must pay adequate attention to breeding and management. As stated by the Director-General in his last annual report, "the remedy generally advocated for the elimination of inferior breeding-stock is the importation of fresh blood from overseas. This no doubt is essential in a number of directions. More important 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 practises, and until it is properly equipped in this respect its full function as a national guiding agent in progressive agricultural development cannot be realized."

The geneticist has already shown that the methods of genetical research and the results of genetical investigation can be applied to stock-breeding, and one of the first requirements in New Zealand in an analysis of the characteristics of our various classes of stock. Analysis must precede synthesis, and a more complete knowledge of the material must be gained before there can be any marked improvement. The problem is one for co-operation between the breeder and the biologist. Experimental-breeding work with farm animals is too expensive to be undertaken lightly by the private individual, and, moreover, it is somewhat embarrassed by conventional breeding systems. It is more profitable to procure animals of an established breed than to develop new strains, for, as definitions go, anything new cannot be purebred and, therefore, as a rule, does not command the market price of an animal whose pedigree is generally recognized. The State cannot afford to neglect the services of the geneticist, and the breeder without the help of genetics cannot hope to achieve the highest success. The extent of the usefulness of genetics to the breeder will be decided by the amount of support the breeder gives to research in this direction.

The proper management of animals cannot be divorced from adequate attention to feeding, but there are also several non-nutritional factors which must be considered if stock are to be maintained in a healthy state. The provision of shelter or housing, the necessity for hygienic conditions, and the maintenance of clear pastures by rotational grazing are some of the points which have been emphasized by the instructional services of the Department, and, when we are considering new lines of investigation into animal husbandry, we must at the same time be careful not to neglect cardinal principles based on past experiences.

The inauguration of a more extensive and intensive campaign of research into all aspects of animal production and management must be preceded by a plan of attack and a conception of the organization that is to carry out the work. We have the nucleus of such an organization in connection with the work which has been planned in connection with the outbreak of facial eczema. This investigation is being carried out by a team of research and field officers whose work is being co-ordinated under a committee of management, which includes both experts and representative farmers. The investigation is the most comprehensive that has ever been made into any single farming problem in New Zealand. The scientific workers include veterinarians, chemists, bio-chemists, plant-research officers, and field officers. After each officer had placed his aspect of the work before the Committee of Management a general programme of research was drawn up, and is now being carried out. In a lesser degree a plan on similar lines has been put into operation in connection with sheep-mortality in Canterbury, where veterinarians, chemists, parasitologists, and the staff of Canterbury Agricultural College are co-operating in an extensive investigation.

There is no reason why the principles of organization employed in these two specific problems should not be extended to embrace a general campaign designed to reduce the stock losses which are occurring in various parts of the Dominion. The central problem of maintaining a healthy animal population is too complex to be dealt with by one particular line of investigation. It necessitates the organization of groups of scientists and experts who have specialized in different aspects of the problem, but whose knowledge and talents are co-ordinated and directed along particular lines of research requiring their attention.

When a general scheme of research is decided upon the question of discovering the problems for investigation and the dissemination of the findings of the research workers must also be considered. There must be a continuous link between laboratory and field-work and the farmer. The facial-eczema campaign again provides the basis of an organization which will keep this link intact. The farmers' representatives on the management committee are closely associated with the problems and viewpoint of the man on the land, and can influence any research along lines which are of the greatest practical benefit. The field officers of the Department also provide a link with research and the farmer, and in any comprehensive scheme they will be the most valuable liaison between science and practice. The farmer is the first to discover the problem, the field officer is able to group its ramifications and report back to the team of specialists, and when knowledge or information of value is discovered by research, then the field officer's duty is to see that it is both disseminated and put into operation in general farm-management.

Naturally it would be impossible to have a staff of field officers large enough to give each farmer individual instruction, and his work of spreading new knowledge must be supplemented by a publicity campaign. The Department has extended its publicity services considerably during the past twelve months, and the outstanding feature of its work in this direction has been the reorganization of the *Journal of Agriculture*, which has been converted from a semi-scientific, semi-instructional publication into a journal of farm instruction providing a continuous flow of information in every branch of farming activity. The scientific principles of the work of the departmental officers have not been abandoned, but they are being presented in a manner which is proving attractive to the farming community. Since the change-over the *Journal* has won the support of a wide circle of readers, and the increases in number of subscribers continue unabated. The Department is also grateful to the press and the National Broadcasting Service for the help they have given in the spreading of advice and information.

When an organization of the nature outlined has been brought into being there then arises the question of administration, and past experience points to the necessity of unified control. It is considered that the greatest efficiency and co-ordination can be achieved when the whole of the research, field, and instructional services for one particular industry are directed from one department. The facial-eczema investigation gives support to this contention. This work is being carried out under the administration of the Department of Agriculture with the valuable aid of a management committee, and the experience which has been gained in the planning of this investigation justifies confidence in proposing its extension in relation to the pressing problems which are facing the agricultural and pastoral industries at the present time. Central control with the addition of committees of management comprising both experts and farmers, the organization of scientific workers into groups instead of isolated units, and the linking-up of research with the farm are the essential steps towards the elimination from our pastoral activities losses which are not only impairing efficient production, but also threatening to set back the main source of national income.

On behalf of the Director-General and myself I wish to record our appreciation of the manner in which all officers of the Department have carried out their duties during the year. The need for co-operation among the various divisions and sections of the Department has been fully realized, and the response in this direction has been most gratifying.

E. J. Fawcett, Acting Director-General.

ACCOUNTS DIVISION.

REPORT OF L. C. SCOTT, ACCOUNTANT.

The availability of departmental finance is only too often a "limiting" factor in the achievement of agricultural progress, whether such progress be on lines normal or abnormal. The normal lines of progress must be foreseen, planned, and budgeted in the early part of each financial year or remain in abeyance until "next year." It is the unenviable duty of the Accounts Division to see that normal progress does not escape this "limiting" factor. Abnormal progress is all too frequently initiated by unfortunate circumstances or conditions calling for special financial provisions. Such provisions generally require to be planned at very short notice, but, when approved, they immediately come within the usual restrictive accountancy influence.

For a year to be successful in the accountancy sense it requires to close without the vote being overspent, or only overspent to the extent authorized to meet the abnormal. The 1937–38 year closed successfully. The net excess of payments over receipts was £845,419, or £31,346 below the authorization of £876,765. This margin was not unexpected, the decision to defer the extension of farm dairy instruction until 1938–39 being one of the main savings. The restrictive influence necessary to ensure the vote being "in balance" requires a full measure of co-operation from the executive officers directing expenditure, otherwise accountancy duties are liable to have rather irritating effects.

In the examination of receipts (£182,713) and payments (£1,028,132) resulting in the net excess of payments (£845,419) it is interesting to note that "Administrative Services" called for payments totalling £407,076 and yielded £106,437 credits (net being £300,639); that "Payments under Statutes" required £100,625 and yielded credits of £3,969 (net being £96,656); and that "Miscellaneous Advances, Grants, Subsidies, &c.," cost £520,431, against which there were credits of £72,307 (net being £448,124). Comparatively, the vote outgoings are much more substantial than incomings. There are, however, other receipts (£100,047) not covered by vote figures (Nauru and Ocean Islands, £35,344; Slaughtering and Inspection Act, £56,243; Dairy Industry Act, £2,455; Orchard and Garden Diseases Act, £1,783; Orchard-tax Act, £2,693; Sundry, £1,529).

Administrative Services.—Eliminate personal services (£279,182) and locomotion expenses (£45,398), and the remaining figure (£82,496) is a most startlingly modest one for working-expenses of three large farms and many small areas, two large laboratories and a seed-testing station, a publications section, numerous grading-stores, offices throughout the Dominion, and the equipment (including telephones, stationery, staff transfers) necessary in connection with a staff of 960 persons (exclusive of casual labour).

Payments under Statutes.—Compensation for diseased live-stock (£45,223), subsidies for destruction of rabbits (£28,402), and a grant for educational purposes (£27,000) are items in rather marked contrast with £82,496 for the working-expenses of the administrative services.

Miscellaneous Advances, Grants, Subsidies, &c.—The payments under this section are also heavy. The main ones are assistance to pig industry (£7,192); assistance to fruit industry (£43,369); noxious-weeds eradication (£87,482); carriage of lime, fertilizers, and farm-produce (£361,561). Apart from these, the sum of £20,827 is required to cover numerous small grants, &c.

Briefly, gross expenditure totalled £1,028,132. Payments under statutes and in connection with advances, grants, subsidies, &c., absorbed £621,056, leaving £407,076 for administrative services. Bearing in mind that out of this £407,076 the sum of £324,580 was paid in salaries and locomotion expenses, one realizes that departmental services to the public is to a large extent intangible, in that much of it is by personal contact. The recent reorganization of *Journal of Agriculture* activities on lines calculated to give the *Journal* a circulation of pre-eminence throughout the Dominion will add a measure of permanence to many of the intangible aspects of departmental service.

Whilst the main volume of the work of the Accounts Division has been in direct relationship to the actual operations of the Department, statistical and investigational problems intimately associated with the primary production of the Dominion have received considerable attention. The data relative to costs of butterfat, compiled in June and July, were utilized by the Committee (authorized by Act) in arriving at the 1937–38 season's guaranteed price. The cost of producing tobacco has been the subject of a comprehensive report. Lime production and distribution has received my attention in co-operation with the Department of Industries and Commerce. I have also been in close association with an officer of the New Zealand Meat Producers' Board in an investigation of many aspects of the freezing industry. Reports on these two last-mentioned activities are in course of preparation.

In conclusion, may I compliment my staff and others with whom I have been associated during the past year. I have received a full measure of hearty co-operation.

LIVE-STOCK DIVISION.

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

Extended activities in almost every direction marked the work of the Live-stock Division during the past year, involving the utmost efforts of officers of every branch who have been called upon to perform the various duties arising in the course of what has been a very busy year. The animal health position of the Dominion, the responsibility for which is carried by this Division, continues to be satisfactory, in so far as the more serious epizootic diseases are concerned, yet the higher incidence of some of the more common diseases of live-stock incidental to the ever-increasing demands of high production and high stock-carrying capacity calls for the most energetic measures possible to adequately cope with the work of investigation and research. During the year the veterinary staff has been strengthened by the addition of nine officers, seven of whom were engaged in Australia. The majority of these officers has been attached to the Department's Veterinary Laboratory at Wallaceville for special field investigational work into sheep and dairy-cow diseases, both in the North and South Islands. Further additions to the staff are necessary, but the great difficulty of securing men with the suitable training to undertake specialized investigational work has hampered the position with regard to efficient staffing. It is expected that some of the students who were granted bursaries by the Government to enable them to study at a Veterinary Teaching Institution overseas will be graduated at the end of the present year, and it is anticipated that some of them will be prepared to take up positions in the Department.

It is pleasing to state that the long-felt want of additional facilities at the Wallaceville Laboratory will shortly be rectified by the completion of the buildings for which plans and specifications have been prepared. These additions will enable the research work at Wallaceville to be extended and carried out under conditions which were previously not possible.

Health of Live-stock.

HORSES.

The general health of horses continued to be satisfactory during the year, and absence of serious contagious diseases of the horse, a position to which the Dominion can claim an enviable reputation, has again to be recorded. Some outbreaks of strangles occurred during the year, but the incidence of this disease was not unusually high. Joint-ill of foals continues to give some trouble, more especially in the Clydesdale breeding districts of the South Island. The condition known as "rye-grass staggers" of horses was observed in many districts during the late summer and autumn.

Horse-breeding.—In past years I have drawn attention to the very unsatisfactory position prevailing regarding the breeding of light horses of the remount or general utility type. The breeding of this class of horse had, unfortunately, reached a very low ebb, with the result that a good type of riding-horse was fast disappearing. It is therefore most gratifying to record that the Government has during the year put the Remounts Encouragement Act of 1914 into operation. The Act provides for the payment of a subsidy to owners of stallions, and the scheme will allow owners of mares to obtain the service of stallions, suitable to leave good types of riding-horses, at a very reasonable fee. Much interest has been evinced in the proposal by such organizations as the New Zealand Racing Conference, New Zealand Trotting Conference, hunt and polo associations, the Royal Agricultural Society, agricultural and pastoral associations, &c. Great credit is due to the New Zealand Racing Conference for the active interest taken in the matter, and for the assistance given in organizing the formation of local remount committees in accordance with the requirements of the regulations under the Act. In this respect thanks are due to the secretary of the New Zealand Racing Conference (Mr. H. R. Sellars) for the untiring interest he has displayed in the promulgation of the scheme. The organization is now under way, and the scheme will be in operation for the next breeding-season. It is to be hoped that owners of mares in districts in which a stallion is subsidized will take advantage of the opportunities offered under the Act to replenish our horses of the hunter and hack class.

With regard to the breeding of draught horses, good prices have been realized for useful farm draught horses in the North Island where the demand is increasing. The breeding of high-class Clydesdale horses continues to be a feature, more especially in the South Island, and high prices are obtained for sound horses of outstanding stamp.

The Dominion has established a high reputation for the breeding of Clydesdale horses, a position which is reflected in the numbers which have been exported to Australia. It is most desirable, therefore, that every encouragement be given to the fostering of this important feature of farm-stock production. In past years comment has been made on the necessity of legislation being introduced with the object of ensuring the soundness of draught stallions used for breeding-purposes. Such legislation is in force in many countries in which draught-horse breeding is an important economic factor. It is to be hoped that the Stallions Bill, a proposed measure which has been suggested for some years back, and which has recently been redrafted, will shortly become law.

CATTLE.

Diseases scheduled under the Stock Act.

Tuberculosis.—The number of cattle condemned in the field in the administration of the Stock Act during the year, either on clinical grounds or as a result of the application of the tuberculin test, was 7,207, compensation being paid in accordance with the provisions of the Act. The tuberculin test was applied to 16,509 cattle, of which number 1,141 reacted, 6·9 per cent.

The total number of cattle, exclusive of calves, examined at the various abattoirs and meat-export slaughterhouses was 500,787, an increase of 83,081 on last year's figures. Of these, 36,992, or 7·38 per cent., were found to be affected with tuberculosis in varying degrees, a large percentage being only slightly affected. This indicates an increase of 0·58-per-cent. infection amongst cattle slaughtered in these premises.

I would reiterate the recommendation that in the control of tuberculosis more extensive application of the tuberculin test should be made compulsory. There can be no denying that the existence of this disease in dairy herds, even though its incidence in New Zealand is low compared with other countries, has a deteriorating effect on the general standard of animal health. The ideal to be aimed at is eradication. If an attempt at total eradication is considered impracticable at the present owing to the financial outlay involved and the difficulty of providing the necessary staff to carry out the testing, I would strongly advocate the commencement of tuberculin testing in areas, with the idea of establishing tuberculosis-free districts. In the past attention has been drawn to the desirability of tuberculin testing all cows supplying milk for human consumption throughout the Dominion. I would again stress this recommendation, which can be regarded as an initiative to a more extensive eradication scheme, and can also be looked upon as an important public-health measure.

Actinomycosis (and Actinobacillosis).—During the year 780 animals were condemned for this disease. Condemnations were confined to (1) cases involving the bony structures of the head which do not readily respond to treatment, (2) run cattle where dosing is not practicable, and (3) occasional cases which fail to respond to potassium-iodide treatment. It is recorded that more farmers are reporting the disease in the early stages, with satisfactory results following treatment.

Malignant Growths.—The number of animals condemned was 488, compensation being paid in accordance with the Stock Act.

Anthrax.—A continuation of the Dominion's freedom from this disease has to be recorded.

Blackleg.—The number of calves vaccinated against this disease in the affected areas of Taranaki and Auckland totalled 35,850, an increase of 6,881 on last year's figure. An increased number of outbreaks were recorded in the Auckland district, but no extension to previously unaffected country occurred, and control measures by vaccination continue to be satisfactory.

Cattle-tick (Hæmaphysalis bispinosa).—The position regarding this parasite remains somewhat as in previous years. In the "A" areas the incidence of tick is largely governed by seasonal conditions. As mentioned previously, there is a growing appreciation amongst farmers regarding the comparative innocuity of the cattle-tick as a skin parasite. This has developed to the extent of requesting the rescinding of the Cattle Tick Regulations in certain areas. Already various concessions have been granted as regards dipping, &c., and the whole position will have to be carefully considered in the near future.

Johne's Disease.—Although confined to the Taranaki and Waikato districts, an extension of the number of farms found affected with this disease has unfortunately to be recorded. In the Waikato the disease was confirmed on eight additional farms, and on seven additional farms in Taranaki. This chronic bacterial infection of cattle presents very great difficulties in the matter of control, a most disappointing feature being the occurrence of further cases on certain farms on which the entire herds have been subjected to twice-yearly tests with the diagnostic agent, Johnin. It is therefore apparent that, at least on a percentage of farms, the eradication of Johne's disease presents most formidable difficulties. On the other hand, the position on many farms on which the number of recurring cases is small indicates a more hopeful outlook. The testing of herds for Johne's disease was carried out in the Waikato by Mr. Marshall, assisted by Mr. Mullins. In Taranaki this work is being performed by Mr. Stephens at Stratford, and Mr. Alexander at Hawera.

Non-scheduled Diseases.

Mastitis.—The loss to the dairying industry occasioned annually by this disease calls for the adoption of the most energetic research into every aspect of the condition. Considerable prominence was given to the disease during the year as a result of the visit to the Dominion of Dr. G. J. Hucker, Dairy Bacteriologist of the Geneva Agricultural Station, New York. During his stay here Dr. Hucker collaborated with the workers at the Wallaceville Laboratory on the subject of mastitis, and by arrangement with the Dairy Board addressed meetings of dairy-farmers in several districts. The outcome of deliberations would appear to indicate a recommendation to dairy-farmers along the lines of intensifying the control measures which have been recommended by the Department, rather than hoping for definite curative measures. The adoption of the brom thymol blue test has been recommended as a general routine herd procedure by farmers themselves. Mastitis-indicator sets have been made available by the Department for use by dairy-farmers, and it is hoped that full use will be made of the test in the coming season. The test enables the farmer to pick out affected cows, and thus affords direct incentive to the adoption of control measures recommended, along with being a guide to the extent to which culling should be adopted.

Extensive research work into mastitis has been planned by the Department to be carried out by officers attached to the Wallaceville Laboratory, the investigation to embrace all aspects of the disease, and the conditions which might in any way appear to predispose to its occurrence. In this work full co-operation will take place with the officers of the herd-testing association, and it is anticipated that with the wide use of the brom thymol blue test during the coming season, added to the intensive inquiry which will be carried out, information will accrue which will lead to a material reduction in the losses occasioned to the dairying industry through mastitis in cows.

Contagious Abortion.—The prevalence of this disease during the year was recorded from dairying districts in more or less its usual incidence. In few instances, however, did any abortion "storms" occur on farms, the number of cows aborting on individual farms being, generally speaking, low. It is accepted that a certain degree of herd immunity now exists which tends to resist any extensive wave of actual abortion.

As pointed out in previous years, the control of abortion disease rests largely in the adoption of hygienic measures in herd-management, by maintaining replacements from heifers bred in the herd, and isolation of purchased animals at calving-time. The blood-test for the disease which is carried out free at the Department's Laboratory affords a useful indication of the extent of infection in th herd.

The result of abortion-infection in a herd cannot be regarded but as most serious, its effects on breeding often involving severe losses through sterility. In many countries various schemes of abortion-eradication have been undertaken. An attempt at control along the lines of establishing abortion-free herds in a definite area would appear to be well worth the serious attention of dairy-farmers.

Temporary Sterility.—Investigations into the problem of delayed conception in dairy herds were continued throughout the year, special attention being given to the bull as a factor in the condition. In this connection much detailed work in examination of bull's semen has been conducted by Mr. Blake in the Waikato. An experiment designed to test the effect of dietetic influence on the breeding potency of the bull, more especially regarding protein-feeding, is being carried out at Ruakura Farm, a number of young bulls being used in the experiment, which will involve a period of several seasons. As pointed out in previous years, the study of temporary sterility includes not only the bull as a factor, but also the cow in relation to the trouble. More extended investigation into the problem has been planned to be carried out in the Waikato, the staff being strengthened by the appointment at Hamilton of Mr. A. L. Thompson, who during an absence from the Dominion of eighteen months spent some time in Denmark, where he was engaged in the study of research methods into abortion and sterility of cows.

Grass Staggers in Cows (Grass Tetany).—As in previous years, the incidence of this disease, which affects dairy cows at varying intervals after calving, was mostly confined to the Waikato district. On the assumption that the condition is associated with a magnesium-deficiency in the blood, the feeding of dolomite in ensilage has been tried, and the results obtained were encouraging. In the treatment of sub-acute cases of the disease the use of magnesium sulphate hypodermically was employed with a good deal of success. As the disease would appear to be the result of an unbalance of mineral metabolism, attention is being directed to an adjustment of feed conditions during the winter and spring periods, with a view to prevention of the trouble.

Milk-fever.—The incidence of this disease was high, particularly in the Waikato, where a type not readily responding to the usual methods of treatment was very prevalent. Commenting on milk-fever, Mr. Marshall, Hamilton, remarks:—

"A common cause leading to milk-fever is the placing of cows in flush green spring feed to 'clean them out' for two to three weeks before calving. The influence of the young spring flush on the mineral metabolism is not clearly understood, but appears to be upsetting."

Trichomoniasis.—The existence of the protozoan parasite trichomonas in the genital tract of dairy cows was shown in three herds in the Waikato district, by Mr. Blake, Hamilton. Reports from Continental countries and the United States of America, where the condition exists, indicate the parasite to be responsible for early abortion and sterility, the bull being regarded as the chief means of transmission from cow to cow. Cases have also been reported from England, and here also the presence of the parasite is reported as producing metritis and abortion in cows.

The significance of this parasitic infection of the genital tract of cows and bulls cannot be overlooked, and a very careful watch has been exercised in all districts to ascertain the extent to which the condition is present. In its detection microscopic examination is made of uterine discharges from cows. The detection of the condition is, however, extremely difficult, particularly in the case of the bull.

The position regarding this parasitic infection is being carefully watched, all field officers having been instructed to immediately report any suspicious cases for investigation. Measures to prevent spread of the infection from known affected farms have been adopted, and the question of regulatory control must receive serious consideration.

Parasitic Disease in Young Cattle.—This trouble has not been so prevalent this year, the dry season favouring a reduced incidence of the disease. Reports indicate good results in calves dosed with the bluestone-nicotine-sulphate drench, but medicinal treatment of any kind is not entirely satisfactory unless supplemented by extra nourishing feed.

Photosensitization.—The exceedingly warm summer with abnormal pasture conditions suggested the possibility of the occurrence of "facial eczema" in stock in view of outbreaks having occurred in past seasons of similar climatic conditions. With this in view, an article by Mr. McIlwaine, District Superintendent, Wellington, was published in the February issue of the *Journal of Agriculture*, in which the factors leading up to the disease were discussed and advisory measures suggested from experience gained in the 1935 outbreak. In so far as cattle are concerned, very little of the trouble appeared until after the close of the period dealt with in this report (31st March). Immediately subsequent to this, however, one of the worst outbreaks as affecting cattle which has occurred in New Zealand unfortunately took place in the Waikato. This will, however, necessarily be more fully dealt with in the next annual report.

SHEEP.

In some districts the season was not a particularly good one for fat-lamb raising, this being reflected in the large percentage of lambs graded "second," particularly at freezing-works in the Wellington district.

Facial Eczema (Photosensitization).—I regret to have to record the autumn of 1938 as one in which probably the most extensive outbreak of the condition in sheep known as facial eczema has occurred, the disease being of particular magnitude in the South Auckland district. The summer was an exceptionally warm one, with dry conditions of feed in January. This was followed by heavy rainfalls in the Waikato during February, with resulting rapid growth of grass, the disease making its appearance towards the end of February. In March weather conditions in South Auckland were particularly dry and there was a tendency for cases of facial eczema to lessen. Unfortunately, at the end of March copious rains fell, which by effect on pasture-growth precipitated a serious outbreak of the disease during the month of April. The trouble was also experienced in other centres of the North Island—Poverty Bay, Hawke's Bay, Manawatu, Wanganui, and Taranaki districts all experiencing outbreaks of the disease, but not at all so serious as the outbreak in South Auckland.

As mentioned in the section dealing with this disease in cattle, an article appeared in the February issue of the Department's *Journal* dealing with the disease and referring then to the great possibility of its occurrence in the autumn, as in the light of past experience the abnormal seasonal conditions prevailing were likely to produce conditions of pasture which would precipitate the disease. The article contained reference to the last outbreak which occurred in 1935, with particular regard to the Manawatu, and included reference to the best-known means of reducing losses from the disease by feed-management. Experiencing by the 1935 outbreak, many farmers in the Manawatu were successful in greatly reducing their losses this year.

The outbreak during April will not be fully dealt with in this year's report, which includes the period up to and ending 31st March. It can be stated, however, that an extensive research organization has been set up in the Waikato to fully investigate every aspect of the disease. Full inquiry into the condition includes the pathology and biochemistry of the disease in the animal, chemical analysis of pasture, complete survey of pasture conditions by agrostologists, &c., the whole involving what must necessarily be a long-term investigation.

The committee of workers includes officers from the Department of Scientific and Industrial Research, and the work is being co-ordinated by Mr. J. F. Filmer, B.V.Sc., of the Wallaceville Laboratory staff. From the farmers' viewpoint, representation on the committee is effected by the inclusion of three members of local farmers' organizations, which gave helpful co-operation during the outbreak.

Full and continued research is most necessary in order to elucidate the factors which evidently precipitate the disease in summers of abnormal dryness. It is definitely a disturbance of digestive and liver functions in the animal, which are brought about by certain conditions of pasture. We are indebted to the South African workers on this disease at Onderstepoort for much valuable light on its causation, and the latest report from there which deals with the isolation from the plant of the icterogenic factor which produces liver disturbance and jaundice in the animal. This aspect is being closely followed here to ascertain its application to New Zealand conditions.

Lamb-mortality in Canterbury.—The heavy losses in lambs and hoggets which have been occurring in Canterbury for some seasons past called for a survey of the position. During the year two departmental Veterinarians have been detailed to carry out investigations into the cause of the mortalities. Mr. Knott being located at Christchurch and Mr. Ewer at Ashburton, whilst Mr. Jones, from the Wallaceville Laboratory, was stationed at Christchurch to carry out parasitological work. The departmental officers are collaborating in the survey with officers of Lincoln Agricultural College.

The survey involves a detailed study of all the conditions obtaining on farms on which losses occur. So far the investigation has shown that some losses from entero-toxæmia (pulpy kidney) occur in much older lambs than are usually attacked by this disease, and even adult sheep have died from this cause. Experimental vaccination has been carried out, and results will be closely watched. The survey has also already thrown some light on the question of parasitism in lambs and ewes. In considering the parasite problem the pasture conditions are being studied in relation to the nutritional aspect, which undoubtedly plays an important part. It has been decided to commence a wide range of pasture analyses in Canterbury, and for this duty an officer of the Chemistry Section will be made available.

Infectious Entero-toxæmia (Pulpy Kidney).—During the year the vaccination of ewes as a means of conferring immunity to their lambs against pulpy kidney developed to a greater extent, the greatest extension taking place in the Dunedin district, where the vaccine was used on fifty farms, some 27,000 ewes being vaccinated. Vaccination was also carried out on a number of farms in the Canterbury district, and Mr. Blair, District Superintendent, Christchurch, reports the results to be satisfactory.

Commenting on the use of the vaccine in the Dunedin district, Mr. Dayus, District Superintendent, reports :—

"The experience of the 1937 season in Otago and Southland, where the vaccine has been used by farmers themselves on a more extensive scale than was formerly possible, has supported the results obtained in the earlier experimental work previously recorded. It was not claimed then that the loss from pulpy kidney in lambs would be entirely eliminated by vaccination of the ewes. The contention was put forward that there was a possibility of reducing the mortality, and this has been the case in the more extended trials under practical farming conditions. In the majority of cases mortality has been very considerably reduced, thus making vaccination a practical and economic consideration. It seems evident that many more sheep-farmers will carry out the vaccination of their ewes next season. The vaccine is being stocked, as before, at the Veterinary Laboratory, Wallaceville, Wellington. That farmers themselves are reasonably satisfied with the results is evidenced by the inquiries received to obtain vaccine for this coming season. Many of those using it on a large sacle last season have already put their orders in for this season's supply, and they are satisfied that the results justify the expense and trouble. It is to be hoped that the vaccination method, which is now developing into an established procedure, will produce permanent results ; if this is so, then we shall have gone some distance on the way to effectively controlling pulpy kidney in lambs."

Lymphadenitis.—The Division continues to advise sheepowners in instances in which a high percentage of sheep are found affected with lymphadenitis on slaughter at freezing-works, and particulars of the precautions necessary to reduce the incidence on the farm are given. Sheep-farmers would be well advised to take more cognizance of this disease in their flocks, as it has a very important bearing on the examination of mutton for export on account of the stringent view taken of its presence in the carcass by the Ministry of Health, England. The eradication or lessening of the disease on a farm is a matter of considerable economic importance.

Pregnancy Toxæmia (Ante-partum Paralysis) in ewes.—Some losses from this disease took place in Hawke's Bay, where owing to dry conditions an acute shortage of feed existed, resulting in a serious loss of condition in the ewes. The disease was also reported as fairly prevalent in North Otago, where a dry season again occasioned feed shortage. The provision of supplementary feed to ensure that no break occurs in the balanced feeding of the ewe flock during the gestation period is the surest way for sheepowners to prevent the occurrence of this disease.

Contagious Ecthyma (Sore Mouth).—Vaccination against this condition with vaccine prepared at the Wallaceville Laboratory continues to give excellent results. In the Tapanui district 2,622 lambs were vaccinated, and in only one of this number did the condition make its appearance. Vaccination in the Wairarapa and Wanganui districts on farms on which the trouble was prevalent gave similar satisfactory results.

Hydatid Disease.—The high incidence of hydatid disease in the viscera of slaughtered stock constitutes a serious reflection on stockowners in the apathy which is generally shown regarding any attempt to control this disease. Owing to the publicity given to the life-cycle of this parasite every farmer should know the relationship between the hydatids found in the lungs and livers of sheep and cattle and the tapeworm of the dog. Until such time as the feeding of raw offal to dogs is discontinued the incidence of this trouble is not likely to become less. The publicity work accomplished by the Hydatid Research Department of the Otago University in its efforts to lessen the most serious aspect of the problem—hydatid disease in human beings produced through infection from dogs harbouring tapeworms—is deserving of the greatest praise, and it is hoped that the legislation which has been passed providing for a year's supply of arecoline hydrobromide (worm medicine) to be issued to each dog-owner at time of registration of the dog will have the effect of materially lessening the incidence of this most serious disease communicable to human beings. The two things necessary for the farmer to do are (1) dose all dogs on the farm with arecoline hydrobromide four times a year, and (2) stop the feeding of raw offal to dogs. If these conditions were fulfilled by the farming community hydatid disease in human beings in New Zealand would in a short time be eradicated.

Liver-fluke and Black Disease.—The control of black-disease in the liver-fluke-infested country of Hawke's Bay is now well under control by the use of black disease vaccine. During the year Mr. Macfarlane, Zoologist, Wallaceville Laboratory, identified the snail which acts as the intermediate host of the liver-fluke in the Hawke's Bay district.

The presence of liver-fluke was reported in both cattle and sheep killed during the year at the Dunedin abattoir. This is the first known record of liver-fluke in Otago. The origin of the sheep and cattle has been traced, and an investigation by Mr. Macfarlane to determine the position has been arranged.

Sheep Blowfly.—The investigation which has been commenced into the blowfly problem in Marlborough continues, Mr. Macfarlane, of the Wallaceville Laboratory, being in collaboration with Dr. Miller, of the Cawthron Institute, in the survey. Mr. Blair, District Superintendent, Christchurch, reports a heavy incidence of blow-fly strike in Canterbury during the summer, the climatic conditions being favourable to the fly.

Foot-rot.—With the exception of Canterbury, the incidence of this disease during the year was not high, yet it must be recognized as a factor of considerable economic loss to the sheep-farmer. Control measures must be based, firstly, on recognition of the contagious nature of the disease, and, secondly, on the definite necessity of strict isolation of affected sheep until recovery takes place. A comprehensive article on foot-rot prepared by Mr. Doyle, Veterinarian, Dunedin, will shortly appear in the *Journal of Agriculture*, and will detail the full measures necessary in the suppression of the disease.

Lice and Ticks.—Careful inspection of sheep exposed for sale at saleyards was maintained during the year by the stock inspection staff. It was necessary in many instances to lay informations against sheepowners for having exposed their sheep for sale in a lousy condition, but the necessity for such action has not shown an increase on past years.

PIGS.

Tuberculosis.—The number of pigs slaughtered for the season 1937–38 at registered premises was 1,085,107. Those slaughtered on holdings and examined at butchers' shops numbered 23,081, making a total of 1,108,188, an increase of 20,190 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 1,128,188. Of 1,079,895 coming under inspection, 198,772 carcasses were found to be affected in varying degrees with tuberculosis, the percentage of infection being 18·41, an increase of 0·08 per cent. as compared with last year. Meat-export works, 883,080; abattoirs; 173,734; ordinary slaughterhouses, 28,293; shops, 23,081: total, 1,108,188.

Suipestifer Infection.—This disease is responsible for considerable mortality in young pigs. Improved sanitation and shelter, with improvements to drainage and general conditions of cleanliness, are being constantly advised. Improved feeding standards also assist in overcoming the infection. Experimental vaccination against this condition with a vaccine prepared at Wallaceville is being tried on a farm in the Waikato.

Pleurisy.—In connection with examination of pig-carcasses at meat-export works, Mr. Collins, District Superintendent, Auckland, remarks:—

> "There has been a reduction in the number of pigs rejected for export on account of pleurisy. This is very gratifying and indicates that more care is being taken in housing and general management."

Sarcoptic Mange.—Outbreaks of this disease occurred during the year both in the North and South Islands. In each instance the adoption of the necessary eradication measures were successful.

Swine Erysipelas.—Three cases of the chronic form of this disease were diagnosed during the year. The condition is extremely rare in New Zealand.

Necrotic Ulceration of the Skin.—This condition still continues to cause rejection of a number of pig-carcasses on inspection. It is definitely an indication of faulty pig-management and should be eliminated by improvement in this direction.

Rejection of Pig-carcasses for Export.—During the year a considerable decrease in the number of carcasses rejected for export because of such conditions as might be considered due to bad management generally has taken place in the Auckland district. This is a very encouraging position to record.

Swine Husbandry.

The report of Mr. M. J. Scott, Superintendent of the Swine Industry, deals very comprehensively with the work which has been attempted during the year in connection with the development of the swine industry, and I submit same hereunder:—

"Further progress in the pig industry has been made in the 1937–38 season by the introduction of the national scheme of instruction commenced in August, 1937, and by the introduction of grading of baconers commenced in February, 1938. These, along with the recording of pedigree sows introduced in October, 1936, mark the beginning of an attempt on the part of the Department of Agriculture to organize the industry, and give a service additional to that already given individually by the field officers of the Department. There still remains the necessity of providing some means whereby better-quality breeding-pigs can be discovered, and the necessity of discovering which, if any, breed or cross could be used with advantage to replace our present mixed pig population. Departmental attention could be given to these matters in the near future if the producers are satisfied that such a service is necessary.

"*Progress of the Industry.*—The present status and past development of the industry is set out in the following table:—

Year.	Number of Sows at 31st January.	Total Pigs killed, Year ending 30th September.	As Baconers.	As Porkers.
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	1,091,845	427,178	664,667
1937	112,921	1,120,905	494,000	626,905

"The table shows the continued increase in total killings for the last year. This amounts in numbers to about 2·6 per cent. only, but in actual weight of meat the increase is nearer 6 per cent., due to the increase in the number of baconers and to a falling-off in porkers, the position having now been reached that more than half the total production consists of pigs of bacon weight—*i.e.*, greater than 121 lb. carcass. There is a slight reduction in the number of sows, and this, combined with the increase in total slaughterings, has increased the killings per sow till it now stands at the satisfactory figure of 10·7. The 1928 figure was approximately 5·7. This figure is perhaps the best single criterion of the state of the industry.

"While the ideal of fourteen pigs slaughtered per sow can be kept in mind, the increase from 5·7 to 10·7 in ten years is decidedly hopeful.

"*Pedigree Sow Recording.*—This service, instituted in October, 1936, has received fair support from the breeders. Up to 31st March, 1938, 493 sows have been entered for recording under the national scheme, and 198 under the auspices of the old Waikato and Manawatu Pig Recording Clubs. The areas served by these two organizations have now been taken over by the Department. Out of the 691 sows entered to date, 286 have qualified in one or other of the five grades. The difference between the numbers of sows entered and those that have qualified is due partly to a lag in time between receipt of nomination and the completion of the test, partly to accidents such as litters being overlain, sows dying, &c., and partly to the number of low-producing sows—*i.e.*, sows with litter-weights of less than 200 lb. at eight weeks old. Accidents between service and farrowing time account for approximately 25 per cent. of sows entered, and low production for approximately 15 per cent. Both these factors are largely man-made, and will probably be eliminated with time.

"Pedigree sow recording alone does not discover the capability of the recorded pigs to produce good-quality carcasses. This aspect of recording should receive immediate attention in the form of a system of advanced registry, based on the ability of the sow to produce (1) good litters, (2) early-maturing pigs, and (3) pigs of good carcass-quality. This subject is now being given consideration by the Department and other interested bodies.

"*National Instruction Service.*—As from the 1st May, 1937, Cabinet gave its approval for the establishment of a levy of 2d. per pig on all pigs killed in licensed plants. This levy was to be used for the purpose of financing a scheme of national instruction. The revenue expected was approximately £7,000 for the eleven months ending 31st March, 1938, and at the present rate of killings should amount to about £8,000 annually.

"The organization established for the administration of the sum realized from the levy consists of a National Pig Industry Council with headquarters in Wellington, eight District Pig Councils, one each at Whangarei, Pukekohe, Whakatane, Hamilton, New Plymouth, Palmerston North, Christchurch, and Dunedin, and a number of pig clubs in each District Pig Council area.

The National Pig Industry Council consists of twenty-five members, representative of every phase of the industry, including one representative from each District Pig Council, and is under the chairmanship of the Director-General of Agriculture. Its functions are to meet at least once a year and advise the Minister of Agriculture on all problems affecting the industry. Its executive consists of the representatives of the eight District Pig Councils.

"The District Pig Councils are composed of delegates from pig clubs, with the addition of any non-pig-club members who may be elected at the club's annual meeting. Each council is controlled by an elected executive of seven or eight members, who meet once a month. It employs a secretary and organizer, who is required, at the jurisdiction of his council, to give whatever service is needed by producers in his area. It receives £800 per annum from the levy fund.

"Pig clubs are local voluntary organizations of from ten to twenty-five producers, who subscribe to a fund sufficient to purchase a pedigree sow and suitable accommodation. One member is appointed custodian. He looks after the sow, whose progeny are distributed, after weaning, for breeding-purposes to club members at a price fixed by the club. The custodian finds the feed-supply and is paid by the club from the sale of piglets. A Selection Committee, consisting of the chairman, secretary, custodian, and other elected members, decides what pigs are fit for breeding-purposes. The club appoints one delegate to the District Council, which is thus largely composed of club delegates.

"Thus from the pig clubs, through the District Councils to the National Council, producers have an opportunity of expressing their viewpoints and of taking a leading part in the development of the industry. To date over two hundred and fifty pig clubs have been formed in eight months over the whole of New Zealand. The movement will be satisfactory when the majority of producers are behind it, and at the present rate of progress this should be quickly achieved.

"*The Grading of Baconers.*—Regulations for the grading of baconers were gazetted from the beginning of February, 1938. From the outset the greatest difficulty about grading was to find some means whereby the producers of better-quality pigs could be equitably rewarded. Several preliminary meetings of those interested were convened during 1937, and it was agreed to institute a three months' trial of grading, during which the measurements of all bacon pigs would be taken by the trade and submitted weekly to this Department. Almost unanimously the trade gave us their assistance and during the three months supplied the weights and measurements of approximately 80,000 baconer carcasses. After analysis and consideration of these it was found impossible to fix on any standards that would be fair both to the producer and to the trade. At that time it was hoped to base the payment of premiums for quality on an average grading that would be true for the whole of our pigs, and fairly constant from works to works. Whatever standards were employed it was found that whereas the New Zealand average of, say, No. 1 primes was 40 per cent., this average fell as low as 20 per cent. in some works, and rose as high as 70 per cent. in others. The only alternative was to use the standards at present employed by English bacon-curers, thereby allowing the trade to pay such premiums for quality as they ultimately received on realization in England. This course was finally adopted, and grading standards based on the thickness of fat over the shoulder and over the loin were ultimately adopted.

"Although breeders and producers have been told for many years that our pigs are too short, payment by curers is not made on the basis of length, and the inclusion of length in the grading standards would have caused a number of pigs to be degraded in New Zealand, with resultant loss to the producer. These pigs would be purchased by the curer as 'second-class,' but would still be fit to be made into first-quality bacon. The object of grading was to pay premiums for pigs of high quality, and this could be achieved only by grading on the standards recognized by the curers.

"Further, there is such a well-defined relationship between length and thickness of back-fat that few short pigs are found to have thin back-fat, and few long ones to be excessively fat on the back. Hence producers are still strongly advised, as before, to concentrate on producing long pigs, since length can be measured while the pig is still alive, and since long pigs tend to be thin on the back.

"The grading measurements are taken by the works grader, who grades the pig and affixes a tag, showing the grade. Meat Inspectors check the grading daily in each plant, and the Meat Board's grader checks it from time to time to ensure uniformity between one works and another. A number of difficulties incidental to the introduction of any new undertaking has been experienced, but with the excellent co-operation of the trade it is felt that these will be satisfactorily mastered.

"*General Activities of Field Officers.*—The services of departmental field officers have been made use of during the last year in two new directions, firstly in the collection of a quarterly census of pigs on a number of farms. Each officer has made arrangements with a number of producers in his district to keep records of his pig production, numbers on hand, sales, purchases, deaths, feed-supply, &c. This information is analysed and summarized at Head Office Wellington, and should become increasingly valuable as the years go by for the purpose of estimating future production when required, and providing information on a number of points connected with the industry.

"The second point on which the assistance of departmental officers will be of value is their co-operation with the District Council Organizers, in advice and service to pig clubs. Each officer can take over three established clubs, visit them in the ordinary course of his duties, and provide them with advice or information when required.

"*Housing and Feed-supply.*—From the reports of field officers it is very evident that deaths from birth to weaning, winter deaths, and rejections at the works still constitute the major sources of loss in the industry. From their reports, also, numerous cases are noted of the elimination of this waste by attention to houses and sanitation. The total elimination of pleurisy and winter deaths, accompanied by the reduction of rejections at the works to less than 1 per cent. of all pigs slaughtered, are frequently reported from many different localities where new accommodation has been erected and where attention has been given to sanitation.

"The question of the kind of accommodation appears to be of much less importance than the broad principle of keeping the pig separated from his own excreta, and providing draught-proof houses that achieve this dual purpose either as sties, open-air pens, or fattening houses. Many new lay-outs of each kind are now in use in different localities.

"*Feed-supply.*—While housing and sanitation is the key problem to the industry, the provision of a cheap and adequate feed-supply still remains the most obvious and acute one to the individual producer. Although this department, through its field officers, strongly recommends the use of small quantities of the best-quality meals, at present prices, for the purpose of producing good litters or supplementing a failing milk-supply for pigs that just require finishing, the fact remains that at New Zealand prices of pork and bacon high-quality grain can be used in quantity only when the price is not greater than about £6 10s. per ton. Where roots can be grown profitably, when costed to pigs at 5s. per ton, a feed-supply is available from this source, at £2 10s. per ton (10 tons roots equivalent to 1 ton of feed), and this along with small quantities of milk, meat-meal, or grain is the only basis of the £3 per cow return that is now being obtained from pigs by a number of progressive producers.

"*Co-ordination of Research Work.*—A start has been made with research work on winter-feeding problems, feed factors influencing growth-rate and carcass-quality, litter-feeding trials, &c., at Ruakura State Farm. Details of what has been done there will be found in another section of this report.

"The inheritance of length and other factors influencing carcass-quality are being investigated at Massey Agricultural College.

"The problems of disease and health of pigs generally are being investigated at Wallaceville, and with the completion of facilities there in the near future it is hoped that a more intensive survey will be possible. It is hoped to co-ordinate the research work that is being undertaken at the above institutions, at Lincoln College, and at all other points where research can be carried out, and by this means cover all the points that require investigation."

Dairy Inspection.

Increased activity in the work of dairy inspection is resulting in a decided improvement in the hygienic standard of dairies in many centres. The work of dairy inspection, which must be regarded as an important public health function, is one requiring unremitting attention on the part of the inspecting officer, and calls for a large amount of instructional service. In the inspection of cows in registered herds supplying milk for household use the tuberculin test is applied in suspicious cases, and many producers request the application of the test to the entire herd. The position is not, however, satisfactory, and the introduction of compulsory tuberculin testing of all cows supplying milk for household use in the Dominion is overdue. A public milk-supply from a tubercle-free source is strongly advocated as an important public health advancement.

Live-stock Statistics.

In 1937 sheep returns, collected as at the 30th April, showed that sheep flocks in the Dominion increased by 1,192,114 to a total of 31,305,818. An increase of 663,116 occurred in the number of breeding-ewes. The number of sheepowners has increased by 587 to a total of 31,177. The number of cattle in the Dominion as at the 31st January, 1937, increased by 135,023 to a total of 4,389,101. The number of dairy cows within the total shown decreased by 15,983 to a total of 1,935,524. The number of pigs in the Dominion as revealed in the 1937 enumeration was 802,419, a decrease of 6,044 on the previous year's figures. Horses show an increase of 1,629 to a total of 277,799.

Meat Inspection and Slaughter of Stock.

The meat inspection staff carried out its onerous duties satisfactorily during the year. Owing to increased pig killings in many centres and the extreme vigilance demanded in inspection methods to-day a further increase in the staff became necessary at the beginning of the season. In the detection of lymphadenitis in mutton carcasses, incision of lymphatic glands became compulsory during the year, in compliance with the requirements of the Ministry of Health, England.

The total numbers of stock slaughtered at registered premises were: Sheep, 3,351,208; lambs, 9,957,734; cattle, 588,656; calves, 1,079,572; swine, 1,085,107.

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, 1938.	Year ended 31st March, 1937.	Increase.
Cattle	322,992	244,834	78,158
Calves	996,436	957,141	39,295
Sheep	2,534,236	2,121,925	412,311
Lambs	9,839,269	9,180,482	658,787
Swine	883,080	807,041	76,039

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 slaughterings from the beginning of each season to 31st March:—

Stock.	1934–35.	1935–36.	1936–37.	1937–38.
Sheep	1,735,237	1,287,331	1,276,234	1,748,035
Lambs	6,626,315	6,269,694	6,536,408	7,040,149

The figures show an increase of 471,801 sheep and an increase of 503,741 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, 1938: Cattle, 500,787; calves, 1,077,393; sheep, 3,134,870; lambs, 9,938,189; and pigs, 1,056,814.

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

Stock.	Abattoirs.	Meat-export Slaughterhouses.
Cattle	177,795	322,992
Calves	80,957	996,436
Sheep	600,634	2,534,236
Lambs	98,920	9,839,269
Swine	173,734	883,080

Stock slaughtered at ordinary slaughterhouses during the year ended 31st March, 1938, was as follows: Cattle, 87,869; calves, 2,179; sheep, 216,338; lambs, 19,545; swine, 28,293. Carcasses of pork killed and dressed by farmers, sent into butchers' shops and small factories, and examined by departmental officers numbered 23,081.

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, 34,729; calves, 20,784; sheep, 254,552; lambs, 104,374; swine, 170,721.

Compensation paid for Stock and Meat condemned.

Compensation to the amount of £17,299 16s. 9d. was paid out during the year for animals condemned in the field for disease under the provisions of the Stock Act, and £27,922 16s. 5d. 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, 55; sheep, 514; pigs, 16; horses, 38 (10 draught). Of the above animals, the following were placed in quarantine for the respective periods required: Horses, 8 (from the United States of America); sheep, 12; cattle, 55; and pigs, 16.

Exportation of Stock.

During the year under review the following animals were exported: Sheep, 13,716; cattle, 83; pigs, 28; horses 8 (draught).

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

Poultry.

The poultry section instructional activities have been continued during the year with the instructional staff of four officers available. Some assistance was rendered during the year by attaching the Poultry-farm Overseer from Wallaceville to the Poultry Instructor at Auckland for the culling-season.

In order that more visits to poultry-keepers other than request visits may be made possible so that diseased conditions may be controlled, it is quite apparent that the instructional staff should be strengthened, and this matter is being given consideration.

The report of the Chief Poultry Instructor (Mr. C. J. C. Cussen) is hereunder quoted:—

"According to figures published by the Government Statistician, it has been estimated that the average annual production of eggs in this country is 375,000,000, and as our egg-export last season only amounted to 841,680 eggs, the local consumption would amount to over 374,000,000, or approximately 235 per person.

"No statistics are available as to the consumption of poultry-meats, but reports indicate that the consumption of poultry in the Dominion could be increased if more good table poultry was procurable, and more concentration on this aspect of poultry production suggests itself. While the chief aim of the poultry-keeper should be the production of eggs, the very best returns will not be secured from the industry unless both eggs and carcasses are sold to the best advantage.

"*Organization.*—Owing to the fact that 166,354 householders maintain poultry and over 80 per cent. of these keep less than twenty-five birds, this industry has always been a most difficult one to organize.

"While there is undoubted evidence of an earnest desire by more poultry-keepers to improve existing conditions and so place the industry on a higher plane there appears to be a lack of uniformity of thought as to the best methods of procedure. Until there is that unity, permanent success can hardly be expected.

"*Health of Stock.*—It is pleasing to report that the industry enjoyed a comparatively good rearing-season, and that the general health of the stock has been better in most districts than for the past few years. The hen when kept under natural conditions is amongst the most healthy of live-stock, but poultry-keepers should remember that with the adoption of mass-production methods and the intensive system of housing there are increased facilities for the occurrence and dissemination of poultry disease.

"In some districts, where a few years ago heavy losses were experienced with coccidiosis, the poultry-keepers, by a good clean up, heavy culling, more attention to the selection of breeding-stock, and not overcrowding, have found that what threatened to put them out of business really proved a 'blessing in disguise.' These facts are mentioned, as there is evidence to show that in some districts previously clean, but where some poultry-keepers from want of experience had become a little lax in their methods, trouble has recently been experienced. If disease is to be checked and controlled it will rest very largely with the poultry-keeper himself, as the best way to fight disease is to guard against it in the natural way by breeding, feeding, and managing one's stock in a way that will produce birds with that constitutional vigour and stamina that will resist disease.

"*Sale of Unfit Stock.*—Where possible the Poultry Instructors have paid visits of inspection to poultry-auction marts, and they report that on several occasions it has been found necessary to condemn stock obviously unfit for sale.

"The spread of disease through auction marts is a matter that seems to call for even more attention, as a number of poultry-keepers fail to realize their responsibility, or the great danger to the industry of offering unfit birds for sale.

"*Egg-export.*—During the past season some 2,338 cases—70,140 dozen—of eggs were shipped to the United Kingdom, as compared with 11,281 cases—338,430 dozen—shipped the previous season. This shows a decrease of 268,290 dozen over the previous season's export.

"Unfortunately, a number of the eggs shipped from Christchurch reached London in a damaged condition. The cause of this trouble has been traced to the use of rather inferior packing-material in the hope of saving expense. Arrangements have now been made for the use, at each exporting centre, of a standard packing-material, and it is trusted that no further trouble will be experienced in this matter.

"It is advisable to again mention that although Christchurch is the largest egg-exporting centre in the Dominion, the facilities for grading, packing, and holding of eggs before shipping are inadequate, and the matter of providing better facilities for this work calls for urgent consideration if egg-export is to be placed on a satisfactory footing.

"*Chick-sexing Examination.*—Two chick-sexing examinations were conducted by the Department during the past year. In all, eight students undertook the examination, two being for first-class certificates and six for second-class certificates. One student qualified for a first-class certificate, and one qualified and had his second-class certificate renewed.

"At the present time there are two students entitled to sex chickens under a New Zealand Government certificate.

"If there are sufficient candidates offering, the Department is prepared to undertake further examinations at the beginning of this hatching season.

"*Chilled Eggs and Pulp in Cool-store.*—Visits of inspection to the various cool-stores and the Statistician's figures show that more eggs in shell and pulp were placed in store during the year than was the case during the previous season. The following are the figures:—

"31st March, 1938: Eggs in shell, 144,880 dozen.
"31st March, 1937: Eggs in shell, 126,773 dozen.
"31st March, 1938: Pulp in store, 1,306,261 lb.
"31st March, 1937: Pulp in store, 644,385 lb.

"Some trouble was experienced with eggs placed in cool-store, and in my opinion the cause of these eggs being in poor condition when taken from the store was due to the fact that they had been packed in more or less soiled fillers and flats.

"In order to save further losses every care will require to be taken to see that only clean, odourless fillers, flats, and cases are used for cool-storing of eggs.

"*Egg-laying Tests.*—Egg-laying tests were conducted at Auckland, Taranaki, Massey Agricultural College, and at Papanui. These tests were well supported by poultry-keepers, and while many fine birds took part, some of the birds failed to come up to standard.

"When the Papanui tests were first started the average production for the fifty-one weeks from all birds was 147 eggs, but by careful selecting, breeding, and feeding the average production has been increased up to over 200 eggs per bird in fifty weeks.

"At first these tests were looked upon as more or less of an egg race, and they served a useful purpose in pointing out the great producing-capacity of certain strains.

"Experience has gradually shown that if egg-laying tests are to be of the greatest value to the industry the conditions governing all tests should be such that only birds of certain quality should be allowed to compete, and that more credit should be given to the breeding-value of the birds and the quality of eggs produced. For some years all birds entering the Papanui test have been passed by the Department's Instructors, but this is not the case at other tests. However, at all tests the Instructors judge all birds and eggs three times during each test, and prizes are awarded accordingly.

"It is pleasing to report that at the present time stricter conditions are being considered, and it is hoped that all tests will be run under more uniform conditions, which will enable these tests to render even greater service to the poultry industry.

"*Wallaceville Poultry Station.*—The Wallaceville breeding and experimental station has had a successful year, and continues to render a useful service to the industry. The demand for eggs and stock for breeding purposes is on the increase. Five feeding-tests were carried out during the year, and a similar number are now being conducted.

"All young stock are now being trap-nested during their first year's production, and by this means much useful information will be gained as to the breeding-value of each individual bird.

"*Instructional Staff.*—Reports from the district Poultry Instructors indicate that they have had a busy year, as their services have been in keen demand. Owing to the extent of their districts it has not always been possible for them to attend to all requests as promptly as they would have liked; nevertheless their work has been much appreciated by poultry-keepers."

Wool.

This section of the Division's instructional activities has been given attention in the direction of bringing about improvement in the general condition and quality of the wool output, particularly in respect to small flocks where mixed types of sheep are the rule. With such varied qualities as are produced from these mixed types, the binning practice must as previously advocated by this Division be recommended, as experience has shown that when wool is not in strong demand this class of wool is either neglected by buyers or bought at a low price, definitely based on the poorer qualities within the bale.

I append the report of the Wool Instructor (Mr. J. E. Duncan) hereunder:—

"Any hopes of woolgrowers for a repetition of last year's excellent prices for wool were quickly dispelled when the selling season opened in Auckland, and the lower level was quickly confirmed at the following sales. Demand was good, at a price, and large quantities of wool on which the growers had placed reserves in keeping with the previous year's prices were passed in at the earlier sales.

"It is a truism that the only certain thing about the wool market is its uncertainty. The wage-level and purchasing-power of the public were high, and business was brisk in Britain, yet towards the end of last year there suddenly became evident, for no apparent reason, a complete lack of confidence throughout the wool trade.

"This could not have been attributed to a glut of raw material, for all sections of the trade were carrying light stocks, and in New Zealand there had been practically no carry-over from the previous season. Another surprise was the comparative inactivity of Japan in the market, for her purchases this season have been negligible compared with the previous one. The Continental buyers were somewhat more active, but again only at a price.

"The gross receipts from wool sold in New Zealand this season are less than those of last season by £6,209,384. This figure does not take into account a considerable further quantity of wool shipped on growers' account for sale abroad and wool bought privately; also wool from fellmongeries and freezing-works. Exact figures for these are not available, but it is probable that the total reduction in receipts from New Zealand wool will be in the neighbourhood of £7,000,000 or £7,500,000 this season as compared with last.

"The following brief comparison of quantities and prices over four years is interesting:—

"*Wool sold at Public Auction.*

	1937–38.	1936–37.	1935–36.	1934–35.
Offered (bales)	687,718	668,397	768,933	527,283
Sold (bales)	614,609	663,798	737,454	471,512
Sold (lb.)	210,151,212	226,089,994	258,270,784	162,538,056
Total proceeds	£8,793,873	£14,903,257	£9,840,427	£4,401,010
Average price—				
Per bale	£14 6s. 2d.	£22 9s.	£13 6s. 10d.	£9 6s. 8d.
Per pound	16·043d.	15·82d.	9·144d.	6·198d.

"This shows that the producer is in about the same position from an income point of view as he was in 1935–36, for although the return is slightly greater this season, costs of production have also risen. In view of the reduced returns from wool, the levy of 6d. per bale for Wool Publicity Research and Propaganda may now seem more onerous, but it is more necessary than ever and should prove a good investment. During the last twelve months reports of discoveries of new types of synthetic fibres and improvements to already existing types have been increasingly numerous. Although some of these press reports must be treated with caution, there is no doubt that the wool-producing countries cannot afford for a moment to ignore these new competitors. Already two or three countries are enforcing the blending of certain proportions of synthetic fibre with wool for domestic use, and it can be said on good authority that some of these fibres which previously were used by the manufacturers only under compulsion are now gladly sought for their improved quality and relatively low price. Already there is a danger in wool prices going too high. As soon as this happens, substitution of the cheaper synthetic materials takes place, and there is a danger of each encroachment being a permanent one. More than ever is it necessary for us to pay attention to the quality of our product and its preparation for marketing. Apart from price, the great advantage of the artificial fibres is their uniformity and standardization. With a naturally varying product, such as wool, we can only achieve uniformity by strict attention to a proper system of breeding and, of course, culling. Those breeders who make the great mistake of trying to follow the market are always one step behind. The subsequent classing and preparation of the clip for marketing are equally important.

"The system of binning, by which each fleece is dealt with according to its merits, is the only method which can adequately deal with small wool clips. These are on the increase—particularly from such districts as the Waikato—and it is gratifying to note that binning is also on the increase. There have been few or no complaints from Home about New Zealand wool of late, and it is the opinion of a very well-known wool-buyer that the amount of hair in evidence among the wool this last season has been less. This is also gratifying, but instruction and propaganda work in this direction will have to continue if this improvement is to be maintained, for there are still many small farmers with whom wool is only a very secondary consideration.

"This season the most noticeable feature about the clip has been its lack of length—very few 'preparing' types being in evidence. There has also been a noticeable lack of weight in some districts (*e.g.*, Hawke's Bay), and this has been due to not only the decreased length but also lack of condition (*i.e.*, grease) in the wool, which fortunately to some extent tends to enhance its value and offset the lack of weight. Cotted fleeces and wool showing tenderness have also been frequently noticeable, and all these conditions are purely seasonal, due to climatic conditions. In parts of the South Island there has been a lack of length in evidence, also due to climatic, but quite different, conditions (viz., drought and lack of feed). This has resulted in rather more dust than usual in some of the Otago and Southland clips, though the dry season allowed growers to shear earlier and avoid bidi-bidi, which was some compensation.

"During the course of the year I have dealt with correspondence on a large variety of subjects, including requests for reports on wool samples. In several cases I have given advice on the farm regarding wool, and have delivered quite a number of lantern lectures and demonstrations to Young Farmers' Clubs. I have also prepared and attended wool exhibits at seven agricultural and pastoral shows, and will probably be doing quite a number more this winter. In this connection I have prepared plans and had built a half-inch scale model of a modern four-stand wool-shed and dip, and have under way a similar model set of sheep-yards. This model has attracted quite a lot of attention where exhibited, and I feel that it is serving a useful instructional purpose. I am at present collecting data for a new and comprehensive bulletin on the design and construction of wool-sheds, yards, and dips, as there is a considerable demand for these particulars. I have also made a preliminary investigation of the question of rugging sheep in New Zealand, and am preparing an illustrated article for the *New Zealand Journal of Agriculture* on this subject, as I feel it has distinct possibilities in this country.

"During the course of the year I have also examined the wool of stud rams for export, prepared a duplicate set of wool samples, and obtained material for a diorama of the sheep and wool industry at the Glasgow Exhibition, prepared plans of wool-sheds, yards, and dips in reply to inquiries, prepared a report on wool allegedly damaged by dip, and collected further data on wool-scouring."

Rabbit Nuisance.

On the whole the position as regards the rabbit pest can be considered as satisfactory, the Inspectors' reports showing that good work is being done in nearly all areas. The slight increase in rabbits that occurred in some localities in the spring and early summer was effectively dealt with by autumn operations.

The methods generally adopted for the riddance of the pest have been poisoning with strychnined carrots, oats, or jam, or as an alternative with phosphorized pollard poison, and in some cases fumigating and shooting, together with a certain amount of trapping.

Owing to the dry spell experienced during the spring months of 1937 conditions were most favourable for the breeding of rabbits, and in some of the recognized rabbit areas the pest was much in evidence by the summer. In these cases steps were taken to see that the pest was reduced and proper control maintained, with the result that where rabbits were numerous they are now reduced to a minimum. Constant supervision is necessary to see that the ubiquitous rodent is kept in check.

In districts where Rabbit Boards carry out the provisions of the Act organized and systematic work is the rule, and they have been remarkably successful in their operations. Departmental Inspectors attend the Board meetings and keep in close touch with the work of the Boards. The successful functioning of existing Boards is leading to the constitution of further Boards.

Noxious Weeds.

Noxious-weed-control work during the year was largely concentrated on ragwort in co-operation with County Councils, and with the assistance of subsidized labour from the Department of Labour. The scheme of operations and the sum of money granted permitted of much more extended work than has been possible in the past, and a considerable improvement in the position is generally reported as a result.

The method adopted was largely dusting with sodium chlorate or Atlacide, mixed with lime in the proportion of 1 in 19, and satisfactory results are reported.

The expenditure for the year under the item of £74,725 provided, including the cost of the subsidized labour, material, and transport, amounted to approximately £74,200.

Blackberry, Californian thistle, variegated thistle, sweet brier, and hemlock are weeds that give a considerable amount of trouble to farm lands, and, unfortunately, sweet brier is gaining an increased hold in certain parts of the South Island, and is proving a difficult weed to deal with in so far as effective means of destruction are concerned, and more investigational work in the direction of finding an effective and practical means of dealing with the large areas affected is necessary. Some work with flame-throwers followed up with spraying or dusting applications of sodium chlorate would appear to give some promise, and this and other means should be followed up. Hemlock has spread in parts of Canterbury, and owing to its poisonous properties will require energetic attention.

Staff.

To the staff as a whole I desire to record my appreciation of their work throughout the year. Increasing demands are ever being put upon officers of the Division, and the readiness with which these have been met is commendable.

VETERINARY LABORATORY, WALLACEVILLE, YEAR ENDING 31ST MARCH, 1938.

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

The year has been a busy one, resulting from increase in diagnostic service, from addition of new staff, and from the visit to the country of Dr. G. J. Hucker, of the New York State Agricultural Experiment Station, Geneva, New York, and Professor John Hammond, of Cambridge University, England. As was stated in the last annual report, there had been an appropriation from public funds for the building of a new laboratory. Plans for this building are now completed, but at the close of the year tenders had not been called, and the building will therefore not be ready for occupation for another year. During part of that time the Officer in Charge has been provided with facilities to travel abroad, visiting South Africa, Great Britain, the Continent, and the United States of America, and during this period the Laboratory will be in the charge of Mr. L. W. N. Fitch.

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

Mr. J. F. Filmer, B.V.Sc., was appointed Veterinary Research Officer and is working on mineral deficiencies of stock.

Mr. M. B. Buddle, B.V.Sc., was appointed Diagnostic Officer.

Mr. T. K. Ewer, B.V.Sc., was appointed Veterinary Research Officer and is at present stationed at Ashburton carrying out a survey of sheep diseases in Canterbury.

CATTLE DISEASES.

Mastitis.—The visit of Dr. G. J. Hucker, from the New York Agricultural Experiment Station, stimulated fresh interest in mastitis. Dr. Hucker spent five months in the country and did much to make the farmer mastitis-conscious. As a result of the visit trials of brom-thymol-blue testing were carried out, as against the plate method, leucocyte assessment, potentiometer, and udder palpation, and the brom-thymol-blue test was found sufficiently reliable to put into the hands of farmers as a field test for diseased udders. The brom-thymol-blue test gives no indication of the type of organism responsible, but picks out those quarters showing an alkaline reaction. The test is being applied widely by the herd-testing association through its testing officers.

Twenty-two heifers were obtained and were calved at Wallaceville and added to the small herd of older cows already in milk. Heifers were milked first. Three heifers were discarded, one for contagious abortion, a second for tuberculosis, and a third which gave too little milk to be worth keeping in the herd. During the whole milking-season there have been weekly tests of the milk by leucocyte assessment and by blood-agar shake-plates. The milk-production of the heifers has also been recorded.

In the nineteen heifers from September to March eight quarters developed streptococcal and six staphylococcal infections. Four heifers had two quarters, six had one quarter, and nine had no quarters affected. Two quarters only gave clinical evidence of mastitis.

By comparison with plate-culture methods the consistent results of examination of quarters by the leucocyte assessment might be stressed. Finally, the amount of staphylococcic mastitis compared with streptococcic should not be overlooked.

All heifers suffered severely from cow-pox during the spring, and it is possible that some of the infection of quarters came from that source.

Cultural tests of cow-pox lesions showed the presence of large numbers of *Staphylococci*, but, more interesting, large numbers of *Streptococci*, which appeared in all cultural tests to be similar to mastitis *Streptococci*. However, more work is required on this aspect of the problem.

The work of the mastitis-control scheme has gone forward, the numbers of Gisborne suppliers having been increased. It is of interest to report that ten of the control-scheme herds investigated by Mr. Ward, Technical Officer to the Dairy Board, have shown that in daughter-dam pairs, where the daughter is affected with mastitis the dam is very frequently affected, sufficiently so to indicate a genetical influence. This work has been made possible by the records gathered over five or more years under the mastitis-control scheme by Mr. A. E. Kidd.

Sterility: Artificial Insemination.—Mr. T. A. Blake has continued his work on artificial insemination of cows at Ruakura. The percentage of cows holding to first service by artificial insemination and natural service are quoted:—

Bull.	Artificial Insemination.	Natural Service.
1	36 per cent. on 30 cows ..	52 per cent. on 42 cows.
2	50 per cent. on 18 cows ..	58 per cent. on 20 cows.
3	22 per cent. on 9 cows ..	44 per cent. on 26 cows.
4	20 per cent. on 5 cows ..	77 per cent. on 27 cows.
5	75 per cent. on 4 cows ..	36 per cent. on 11 cows.

This shows that of 66 cows artificially inseminated 39 per cent. held, while of 126 cows naturally served 53 per cent. held to the first service. Mr. Blake considers that he might have got better results if he had used liquid paraffin to prevent contact of the spermatozoa with the glassware.

Examination of Semen of Bulls.—Mr. T. A. Blake classified 65 bulls by semen examinations as: Good, 14; fair, 16; poor, 25; bad, 8; sterile, 2.

To date Mr. Blake has examined 1,170 bulls, 13 stallions, 16 boars, and 5 rams, and an attempt is being made to classify the results.

Trichomoniasis.—A sharp watch is being kept for further cases of this disease. All field and abattoir veterinarians have been instructed by the Director of the Live-stock Division to forward suspicious material to Wallaceville for confirmation. A fair number of samples have been received, but no further cases have been detected at Wallaceville.

Mr. Blake records a second herd affected in the Waikato.

In addition to material examined at Wallaceville, Mr. Blake has examined several specimens of pus from herds and from meat-works' cows, but has not demonstrated the *Trichomonad* in any of them. He records the presence of very small protozoan parasites in the semen of a sterile bull, and this observation was confirmed at Wallaceville. The parasites were morphologically similar to *Trichomonas* bovis, but much smaller. They were not found when the bull was examined on two subsequent occasions, and the significance of their presence is not known.

Bull-feeding Experiment.—An experiment has been started at Ruakura to test the effect of diet on bull-fertility. Four groups of six young bull calves, as closely matched as possible for weight, are to be maintained on the following types of diets: (1) High protein; (2) high carbohydrate; (3) stall fed on high concentrate-containing ration; (4) grass fed control—*i.e.*, normal method of bull feeding in New Zealand.

Grass Staggers and Milk-fever.—Losses attributed to milk-fever and grass staggers were somewhat severe in the Waikato this year. Mr. Marshall has continued his observation on the use of dolomite in ensilage and considers it fair to conclude from the results of three seasons' work that dolomite has been of considerable value in preventing grass tetany. Dolomite was fed in ensilage to cattle on twelve farms where grass tetany is usually experienced. On eleven of these no cases of grass tetany occurred, but on the twelfth farm four cows were lost. On two farms only did milk-fever occur, and Mr. Marshall considers that dolomite feeding checks the development of this condition also.

Johne's Disease.—Semi-annual tests are now being conducted on thirty-five herds. A total of 2,956 cows were tested this year with 131, or 3⅓ per cent., reactors. Material from the majority of these cases was examined at the Laboratory in an endeavour to check them by the demonstration of typical bacilli.

Ragwort.—A heifer has been stall fed for some eighteen months during which it has consumed daily an average of 1 lb. of ragwort in the rosette stage. The cow showed no ill effect, however, until she received regular doses of ragwort infusion. She then commenced to lose condition. After three months she was turned out to pasture, and is now being kept under observation.

Sheep Diseases.

Photosensitivity.—An early watch is being made to determine whether livers of lambs will show any damage which might indicate the possible future occurrence of facial eczema. During the later part of February and March a number of cases of facial eczema were reported, and the position in the Waikato became serious following rains at the end of March accompanied by warm conditions.

The importance of this condition is now well realized, and a committee composed of representatives of the Veterinary Laboratory, Wallaceville, the Chemical Laboratory, the Department of Agriculture, and the Department of Scientific and Industrial Research, under the chairmanship of Mr. J. F. Filmer, has been formed to investigate the disease during the forthcoming year. Methods of combating the disease are to be tested in addition to investigations of a fundamental nature aiming to elucidate more fully the aetiology of the condition.

Canterbury Sheep Survey.—Mr. T. K. Ewer, B.V.Sc., H.D.A., has been temporarily transferred to Canterbury to investigate with Mr. G. K. L. Knott, M.R.C.V.S., the underlying causes of lamb-mortality in this province. Mr. R. L. Jones has been sent to Christchurch to assist by carrying out routine parasitological examinations. Indications so far are that parasitic infestations are heavy—the main pathogenic species being *Trichostrongylus* spp., and in some cases *Haemonchus contortus*. In some cases clinical evidence of entero-toxæmia has been confirmed by laboratory methods. Entero-toxæmia has been diagnosed not only in lambs, but also in two-tooth sheep. In common with other districts, young sheep do not seem to do well under moist conditions with the grass coming away quickly. The view that this is largely due to increased water content and associated faulty digestion due to lack of incentive to cud-chewing seems to be gaining favour.

Mr. Jones made parasite counts of a number of sheep from the field and from works. In addition to the above observations a few very heavy *Ostertagia* infestations were observed. It is interesting to note that while the majority of the sheep were free from hookworms some showed a fair number. A prime lamb from one meatworks carried sixty-eight *Monodontus trigonocephalus*.

Ragwort.—Two of the four sheep mentioned in the 1936–37 report as having been fed daily 1 lb. each of rosette-stage ragwort since August, 1936, are still doing well on the same diet.

Of the other two, one died but showed no signs of ragwort cirrhosis at autopsy. The second received ragwort infusion for several days, when it was killed owing to its loss of condition. The liver showed small hæmorrhages in the vicinity of the central veins and signs of general toxic effects.

Pig Diseases.

Zinc Poisoning.—Experiments on the production of zinc poisoning by feeding zinc in the form of zinc lactate were continued. Two pigs were fed milk containing 2·02 grams zinc lactate per gallon, and two milk containing 1·01 grams per gallon. They received approximately half a gallon of milk each per day at first, but this was increased until after the first month they were getting 1½ gallons each per day. Within three months they all developed symptoms of zinc poisoning, and three of the four succumbed. Further experiments with smaller doses of zinc are in progress. Pigs receiving 0·5 grams zinc lactate per day for two months still show no ill effect.

Sterility.—Dr. I. J. Cunningham has commenced an experiment to determine the effect of various diets on the fertility of male pigs.

Mr. T. A. Blake has examined semen from two boars, one of which he considered fair and the other poor.

Stephanuris dentatus.—One or two pigs killed at the Auckland abattoir showed kidney-worm infestation, this being the first time this worm has been seen in New Zealand.

Parasitology.

Blowfly Investigation.—Owing to the departure of Mr. V. G. Cole, work on this subject has been somewhat curtailed. Mr. W. V. Macfarlane has taken over the blowfly work in Marlborough which was commenced by Mr. Cole. He is conducting a survey of blowfly strike and studying the types of strike and the fly species concerned. An experiment designed to determine the value of trapping was largely unsuccessful owing to the low incidence of strike in the untrapped controls. Fleece-rot occurring during hot, humid weather was considered to be an important contributing factor to back strike.

Rotational Grazing Experiment.—Two groups of fourteen similar lambs are being run in an experiment designed to test the benefit of rotation. Regular weighings of sheep and egg counts are being carried out. After some seven months the sheep in both groups are fairly comparable. However, three sheep of the unrotated group have died as against one of the rotated group.

Intestinal Parasites of Sheep.—A limited amount of work only was done on this subject. Mr. Jones carried out a number of routine parasite counts in connection with the Canterbury sheep-disease survey. It is felt that intestinal parasites play an important part in sheep mortalities in this district.

Liver-fluke of Sheep.—Mr. Macfarlane has investigated the snail intermediate host for *Fasciola hepatica* in the Hawke's Bay district. Whereas it was formerly believed that the intermediate host was the small black mollusc (*Potamopyrgus*), the only snail actually shown in the recent survey to act as host was *Myxas ampulla*. Usually fluke country showed about 5 per cent. of this species to be carrying parasites, which were identified by feeding to rabbits at Wallaceville. The mature fluke was recovered from the rabbits after some fifty days (see publication).

A few cases of liver-fluke infestation have been reported from Otago. This is the first time that liver-fluke has been recorded in this district. There are also odd cases in the Nelson district, and Mr. Macfarlane is to survey the position as soon as opportunity offers.

Davainea proglottina.—Mr. Macfarlane is investigating the intermediate host of this parasite in New Zealand.

Deficiency Diseases.

The value of pure cobalt in bush sickness was demonstrated by a cobalt-drenching experiment on sheep at Arohena (see publication). It is being found that country previously thought to be normal may be somewhat low in cobalt, and cobaltized lick is being popularized. Cobaltized lick is to be preferred in some cases to limonite which is sometimes low in cobalt. A mixture of the two is frequently advocated.

Mr. Filmer, who, in association with Underwood, was responsible for the early cobalt work in Western Australia, took up his duties at Wallaceville during February. He will be responsible for the activities with regard to nutritional diseases and will work in collaboration with Dr. I. J. Cunningham. Mr. Filmer is planning a cobalt top-dressing experiment with a view to determining the concentration necessary for maintenance of health, and at the same time will study the pathology of bush sickness.

Dr. Cunningham has commenced experiments to determine the physiological action of cobalt.

DIAGNOSTIC SECTION.

Report of L. W. N. Fitch, B.V.Sc., Assistant Officer in Charge.

This is the first year in which the activities of the Diagnostic Section have been in any measure distinguished from those of the Laboratory as a whole. It has hitherto been the practice for all Veterinarians at Wallaceville to share in the diagnostic duties while carrying out research into various problems as opportunity offered.

Owing to the resignation of our senior Laboratory Assistant at a time when seasonal activities were very heavy, and to his not being replaced for some months, we were for a while somewhat handicapped. However, with the arrival in September, 1937, of Mr. J. J. G. Peddie as Senior Bacteriologist, and in January, 1938, of a second veterinary officer in Mr. M. B. Buddle, we were in a position to organize the activities of the section along lines ensuring its most efficient operation.

Briefly, the work of the Diagnostic Section may be defined :—

(1) The examination of pathological material.

(2) The preparation and distribution of biological products and the distribution of certain imported biological products.

(3) The investigation of a variety of disease problems which do not fall within the province of a whole-time research officer.

The following material was received for examination :—

	Wallaceville.	Hamilton.
Milk-samples—		
Routine—		
Positive	414	3,642
Negative	437	4,183
Mammitis-control scheme—		
A Group	2,187=41·40 per cent.	17,913=61·17 per cent.
B Group	2,361=44·69 per cent.	8,331=28·45 per cent.
C Group	735=13·91 per cent.	3,039=10·38 per cent.
Quarter samples	..	3,952
Biological test for T.B.—		
Whole milk—		
Positive	5	..
Negative	34	..
Skim-milk—		
Positive	..	..
Negative	36	..
Whey—		
Positive	..	..
Negative	2	..
Contagious-abortion milks—		
Positive	..	..
Negative	16	..
Contagious-abortion wheys—		
Positive	..	135
Negative	..	135
Blood-samples—		
Contagious abortion : Cattle—		
Positive	285	180
Negative	678	496
Contagious abortion : Pigs—		
Positive	..	..
Negative	5	..
Specimens from cattle (other than Johne's Disease)	332	..
Johne's Disease—		
Confirmed	75	..
Unconfirmed	138	..
Specimens from sheep	275	..
Specimens from pigs	187	..
Specimens from horses	17	..
Specimens from poultry	237	..
Specimens from dogs	2	..
Miscellaneous specimens	158	..
Tumours	41	..
Biochemical Section	703	..
Total	9,360	42,006

Vaccines and Sera, Etc.

Black-leg Vaccine.—Fifty-five thousand doses of formalinized whole culture were prepared and issued.

Commonwealth Serum Laboratories.—The Laboratory continues to act as New Zealand representative of the Commonwealth Serum Laboratories, Victoria. The products chiefly used were entero-toxæmia and flock disease vaccines and distemper antiserum.

Distemper. The Laboratory imported from Messrs. Burroughs, Wellcome, and Co., London, on behalf of New Zealand dog-owners, nearly five hundred doses of distemper virus and hyperimmune serum. By carefully arranging supplies, which are brought out in cold storage, so that they are used within three weeks of arrival, satisfactory results have been obtained. The vaccine is issued only on condition that the vaccination is performed by a qualified veterinary surgeon.

Johnin.—We are again indebted to the Medical Research Council, London, for making supplies of Johnin available.

Contagious Ecthyma.—A considerable amount of vaccine was prepared and issued. Results of vaccination were very good, although in one instance an outbreak occurred following vaccination. The symptoms were, however, very mild. The failure of the vaccine was attributed to the fact that it was somewhat old. Quite a good "take" had resulted from vaccination.

Salmonella Suipestifer.—At the request of Mr. D. Marshall a formalinized vaccine was prepared for use on certain farms where heavy losses from this cause are experienced. Vaccination was carried out on six farms, and at the end of the year Mr. Marshall considered that the results appeared promising.

Cattle.

Trichomoniasis.—A number of specimens of vaginal discharge and uterine pus were examined for trichomonads, but, with the exception of a few known positive cases supplied by Mr. Blake for observation, no positive diagnosis was returned. There appears to be no evidence that the condition is spreading.

Staining of trichomonads was found to be difficult and their culture was usually complicated by the presence of contaminating bacteria.

Sheep.

Entero-toxæmia.—Contrary to usual experiences, a number of lambs are reported to have been lost from entero-toxæmia after weaning. In several cases the presence of *Cl. ovitoxicus* toxin in bowel filtrates has been demonstrated.

Following field observations that lambs on rape seemed especially prone to entero-toxæmia, an attempt was made at Wallaceville to increase the susceptibility of sheep to this condition by drenching them with steam distillates of rape prepared by the Chemistry Laboratory. The effort was unsuccessful, as also were similar attempts using various sugar solutions. In no cases were we able to cause entero-toxæmia in such sheep by drenching with cultures of *Cl. ovitoxicus*.

Photosensitivity.—Material has been examined particularly with a view to determining when and why the liver-damage occurs. Specially selected livers are being examined histologically, and an attempt is being made to reproduce the condition by inoculation and feeding of sheep with bile rich with phylloerythrin.

Blackleg in Sheep.—On two occasions *Cl. chauvoei* has been isolated from cases of blackleg in sheep. The causal agent was determined only by guinea-pig inoculation. Both cases were from the one farm, and losses were not extensive.

Enzootic Icterus.—Organs from sheep affected with enzootic icterus have been examined for copper content, and these have in several cases proved to be very high in copper, as much as 3,280 parts per million, which is at least ten times the normal value for sheep's liver. Attention has been given to the Australian theory that *Cl. Welchii* may be responsible for this condition, and in two cases fairly heavy cultures of this type of organism were obtained from the ileum. We were, however, unable to demonstrate the presence of toxin in filtrates from this part of the bowel.

Mr. Buddle is starting an experiment to investigate the possible role of copper and *Cl. Welchii* infection in enzootic icterus.

Lambs' Livers for Export.—A complaint that lambs' livers for export had deteriorated in cold storage was investigated. The livers were soft and showed extensive deposits of tyrosine crystals. It appeared that proteolytic autodigestion had occurred, and it was decided that this was probably due to a combination of circumstances, including the practice of packing the livers in tins while still hot, and storing in the cold room in large stacks in which the air-circulation was not uniform. Support to this latter suggestion was offered by the fact that affected tins appeared to be confined to the centre part of the stack.

Titration of Lambs' Sera for Pulpy-kidney Antitoxin.—A number of sera from lambs whose mothers had received the routine ante-natal injections of formalinized entero-toxæmia vaccine were titrated for antitoxic content. Owing to the limited numbers of mice available it was not possible to examine a very extensive range of sera, but it was amply demonstrated that sera taken from lambs during the first three weeks contained a fairly high concentration of antibody. While it is realized that the significance of such values is purely relative, some idea may be gained from the fact that 1 c.c. of serum was capable of protecting against up to sixteen mouse lethal doses of a toxin whose average lethal dose was 0·06 mgms. Some difficulty was experienced in titrating sera of low antitoxin content. If a test dose of toxin of any magnitude was to be used the maximum amount of serum that could be injected had to be employed. This, of course, strictly limited the number of inoculations that could be made from one batch of serum, as large amounts of blood could not be taken from very young lambs.

Pigs.

Swine Erysipelas.—Three cases of chronic swine erysipelas have been reported. Two of these showed large vegetations of the atrio-ventricular valves, and *Erysipelothrix rhusiopathiae* was cultured from both these cases. In the third case, of which the heart was not seen, the skin showed extensive urticaria typical of the disease. Two further pigs' hearts were received showing marked endocarditis. Erysipelas was not found in these cases, which were probably streptococcal in origin.

Abscesses in Pigs' Glands.—Owing to the occurrence of small abscesses in a number of glands of export pigs, a bacteriological examination of several superficial lymph glands was made with a view to determining whether any particular organism was constantly present. Some forty-two specimens were examined, and all these showed a mixed bacterial flora. In addition to other organisms, two of the glands were found to contain spirochætes, two were tuberculous, and one on culture showed presence of a diphtheroid morphologically similar to *C. pyogenes*, but differing in cultural characteristics. In fifteen cases *C. pyogenes* was isolated on culture.

Pasteurization of Skim-milk for Pigs.—Tests were carried out on a small steam-pasteurizing plant which is intended for farm sterilization of skim-milk where the incidence of tuberculosis in pigs is high. The plant maintained the milk at a temperature of approximately 170° F. for approximately thirty seconds. It was found to be quite effective in destroying the tubercle bacillus. Experiments were carried out in which milk containing tubercle bacilli was passed through the sterilizing-plant and subsequently tested for pathogenicity by guinea-pig inoculation. The deposit from a definite amount of milk was inoculated into guinea-pigs before and after pasteurization. In no case did a guinea-pig inoculated with pasteurized milk develop tuberculosis. The virulence of the milk in the quantities used was satisfactorily demonstrated by the development of tuberculosis in animals inoculated with the unheated milk.

The apparatus provides a supply of hot water while in use, and while perhaps it is illogical to attempt to combat tuberculosis in pigs by pasteurizing milk rather than by striking at the root of the problem—the tuberculous cow—it is felt that the former measure is preferable to no action at all, which may be the case when a farmer declines to have his herd tuberculin tested for fear of too heavy losses through condemnation of reactors.

Poultry.

Leucosis.—Experimental work on this subject has been carried out. It has been shown that a myelogenous from of leucæmia occurs in New Zealand, and that this is readily transmissible from fowl to fowl by intraperitoneal injections of suspensions of diseased organs. It is also transmissible by Berkefeld N. and Seitz E. K. filtrates, although less readily than by cell-containing suspensions. The causal agent has now been passed through birds to the third generation, during which series some birds developed erythroleucosis and leucæmia, while some developed pure erythroleucosis. This condition is characterized by severe anæmia associated with the appearance in the circulation in the later stages of large numbers of large, primitive, undifferentiated cells with large, round, regular, deeply basophilic nuclei. These are presumed to be very early precursors of red cells, and this contention is supported by the extensive range of intermediate cell types seen in smears. Naturally occurring cases of erythroleucosis have not been recorded. As post-mortem examination of affected birds may reveal no gross abnormality, such cases might be missed. A routine examination of blood from sick birds is to be carried out whenever possible.

Fowl Paralysis.—Sporadic cases occur in which there is definite enlargement of the sciatic nerves. All attempts at transmission of the condition by inoculation of nerve and tissue extracts have been unsucessful.

Miscellaneous.

Bacteriological Contamination of Eggs.—Following reports that deterioration had occurred in a shipment of export eggs, many of which contained bacteria of the genus *Pseudomonas*, an investigation was made of the conditions which predispose to bacterial contamination of eggs.

It was found that eggs, either washed or unwashed, usually remained good for a period of at least six weeks if kept at a temperature of 22° C. Even the deliberate exposure of eggs to cultures of *Pseudomonas fluorescens* by swabbing them with cultures resulted in only a few of them becoming affected by this organism.

Exposure of the eggs to moist conditions, however, resulted in their becoming rotten in two to three weeks even in the absence of *Pseudomonas*. It was observed that eggs may contain a sufficient concentration of *Pseudomonas* to produce a vivid fluorescence of the albumen and remain otherwise normal. *Pseudomonas* was found to be of quite common occurrence in the egg-washing appliances used in preparing eggs for export, and has frequently been isolated from such material.

It is interesting to note that of a batch of eggs imported from England by air-mail for hatching (which, incidentally, were all infertile), *Pseudomonas* was cultured from one of the twelve.

NUTRITION SECTION.

Report of I. J. Cunningham, M.sc., Ph.D., Research Officer in Animal Nutrition.

The writer has again been absent on leave during the greater part of the year, and Dr. Marion M. Cunningham has been responsible for the activities of the section. Work has been continued on the relation between dietary protein and sterility, on magnesium metabolism, and on vitamins A and D. A considerable amount of work of a general nature has been carried out, including the testing of materials for toxicity to animals, while amongst the new lines of work commenced is an investigation of the physiology of cobalt metabolism.

Dietary Protein and Sterility.

Males.—It was previously reported that evidence in support of the contention that certain specific amino acids were necessary for spermatogenesis had been obtained from experiments on rats in which protein supplements were made to diets known to produce sterility. This aspect of the work is being continued, employing a large variety of proteins. So far the protein of bull testes has been found to be the best protein to prevent testicular degeneration, while casein is intermediate and meat-meal and blood-meal are much less effective. The work is being continued with other proteins.

Experiments have also been made to determine whether the degenerated testis is capable of regeneration after the animal is transferred to a diet known to produce fertile animals. The evidence is that no regeneration occurs.

Pig-feeding Experiment at Wallaceville.—In this experiment five groups of boars are being fed diets similar to those shown to produce sterility in rats. The first diet is composed mainly of wheat, the second mainly of peas, the third mainly of maize, the fourth mainly of hulled oats, while the fifth is mainly peas and meat-meal. The object is to find whether the effects of these rations will be the same in pigs as they are in rats—viz., sterility with the maize and oats and with the high-protein rations.

Bull-feeding Experiment at Ruakura.—The aim of this experiment is to test the effect of high-protein rations on bulls. The experiment has been commenced and comprises four groups of six animals. The effects of high-protein rations, low-protein rations, the normal Ruakura Farm ration, and a ration similar to that in use to stall-fed animals in Britain are being compared.

Females.—The influence of dietary protein on the œstrus cycle of females is being investigated. Proteins of different biological value and in different proportion of the ration are being fed and the vaginal smear technique is being employed to study the œstrus cycle. The work so far is in its preliminary stages.

Magnesium Metabolism.

The first stage of the experimental work on the relation between dietary magnesium and urinary calculi has been concluded. A detailed account has been published in the February number of the *Journal of Science and Technology*, but the main conclusions were as follows: High blood calcium and high urinary calcium were the first essentials to stone formation. Such a state could exist, however, without pathological result, provided the blood magnesium was kept normal by an adequate dietary supply of magnesium. When magnesium was withdrawn from the ration while the urinary excretion of calcium was high, stones were formed in the kidneys or bladders. Magnesium, therefore, exerted a determining influence on the formation of stone. The stones were largely calcium hydroxide with traces of calcium carbonate.

Grass Staggers.

Active work on grass staggers has been temporarily suspended. However, the prophylactic treatment first suggested in 1934 and subsequently experimented with annually in the Waikato district has achieved a considerable measure of success. The method is to include finely ground dolomite in ensilage while it is being made, or to supply dolomite as licks or by other means. Mr. D. Marshall, who has been supervising the practical work in the Waikato, is of the opinion that the method is of considerable value when properly adhered to. The measure is largely empirical, and it is intended to reopen the investigation later.

Samples of grasses and hays have been analysed periodically from certain plots for some years now, and this work is continuing.

An experiment has been arranged, in co-operation with the Dairy Research Institute in Palmerston North, in which the effect on the blood magnesium of milking-cows is to be determined when such cows are fed perennial rye-grass, Italian rye-grass, or clover. The blood calcium and phosphate in addition will also be determined. Such an experiment will yield information on the possible part played by rye-grass in the etiology of grass staggers.

Vitamins.

The work on vitamins has had to be curtailed somewhat owing to the demands of other work in the section. Further assays have, however, been made on some New Zealand fish-liver oils and on one sample of commercial oil.

Cobalt.

Experiments have been commenced to determine the physiological action of cobalt. It is proposed to test first the effect of feeding to rats a diet deficient in cobalt. A ration has been devised which is extremely low in cobalt, and it is now necessary to test whether the deficiency is sufficient to produce pathological effects. A comprehensive scheme of work has been drawn up, but progress will be slow owing to limitations of staff and accommodation.

Miscellaneous.

A number of samples of foodstuffs—*e.g.*, meat-meals, &c.—have been tested on rats for suspected toxicity in connection with losses in stock. The results have all been negative.

BIOCHEMICAL SECTION.

Mr. S. W. Josland reports as follows:—

During the year the facilities available in the biochemical laboratory have been fully utilized by those research officers engaged in animal-disease investigations. In addition, a large amount of routine material has been dealt with for field officers throughout New Zealand.

Investigational Work.

Cobalt Metabolism. The experiment in progress at Mamaku has been concluded. Owing to the uneven nature of the sheep used, and the heavy mortality (24 per cent.) among all groups of the experimental animals due to toxæmic jaundice and ragwort poisoning, the experiment proved unsatisfactory. No cases of bush sickness occurred, even among the animals in the control (untreated) paddock, the pasture-cobalt content of which was comparable with values obtained in typical Glenhope bush-sick pastures. Extensive hæmatological examinations were made, and the results obtained will prove valuable for comparison in future experiments.

Another experiment designed along different lines has been commenced at Mamaku by Mr. Filmer.

Experimental Production of Bush Sickness.—The attempt to produce bush sickness at Wallaceville by feeding healthy sheep on Mamaku hay and swedes was unsuccessful. After some weeks on the ration the sheep developed ketosis, which proved fatal.

The Polycythæmic Effect of Cobalt.—Of eight rats which received 1 mg. cobalt daily in a stock diet only one developed a sustained polycythæmia. Some hæmopoietic stimulation occurred in the remaining seven animals early in the experiment, but this effect was not sustained. The occurrence of the polycythæmia was correlated with the amount of cobalt stored in the body. The presence of 0·05 mg. cobalt in the entire body of a rat was accompanied by a polycythæmia.

Acetonæmia in Cattle.—A series of blood-ketone determinations in cases of suspected grass tetany and milk-fever have shown that ketosis may accompany these conditions. During next season a more comprehensive series of blood-ketone estimations will be made in order to determine the relative prevalence of ketosis at parturition.

Photosensitization.—Very little material was available for examination during the past year. Numerous bile and blood samples from affected animals have been obtained during April, 1938, and these are being examined for the presence and determination of phylloerythrin.

Correlation of Mastitis and pH of Milk.—Using the quinhydrone electrode, a series of pH determinations were made on milk samples from cows in the laboratory herd. Normal milk—*i.e.*, milk which had at all times been free from pathogenic organisms and had not shown a leucocytic increase—gave pH values varying between 6·44 and 6·64, with an average of 6·51.

Lactation Tetany.—To test the findings of Blakemore, Nicholson, and Stewart (*Veterinary Record*, 3rd April, 1937), who suggested that the drop in blood magnesium was associated with a high manganese content of the pasture, a limited number of blood-manganese determinations were made in cases of grass staggers. The values for blood manganese in these cases were within normal limits, however.

The total number of specimens analysed was 703, made up as follows:—

Blood—			
Sheep	300	Urine samples	43
Cattle	82	Bone samples	32
Pigs	9	Milk samples	92
Fowls	11	Miscellaneous samples	18
Rats	92	Calculi	4
Miscellaneous	20		
		Total	703

PUBLICATIONS BY OFFICERS OF THE VETERINARY LABORATORY, WALLACEVILLE, 1937-38.

"Care in Drenching Sheep." L. W. N. Fitch. (1937) *N.Z. J. Agric.*, 55, 42.

"Chronic Zinc Poisoning in Pigs: Result of Experimental Feeding of Pure Zinc Lactate." R. E. R. Grimmett, I. G. McIntosh, E. M. Wall, and C. S. M. Hopkirk. (1937) *N.Z. J. Agric.*, 55, 216.

"Coccidiosis in Poultry." L. W. N. Fitch. (1937.) *N.Z. J. Agric.*, 55, 274.

"Cobalt Feeding Experiment at Arohena." C. S. M. Hopkirk. (1937.) *N.Z. J. Agric.*, 55, 344.

"Dietary Magnesium and Urinary Calculi." I. J. Cunningham, and Marion M. Cunningham. (1938.) *N.Z. J. Sci. & Tech.*, 19, 529.

"Further Observations on the Production of Cobalt Polycythæmia in Rats." S. W. Josland, and K. J. McNaught. (1938.) *N.Z. J. Sci. & Tech.*, 19, 536.

"Importance of Cobalt: Relationship to Health of Farm Animals." C. S. M. Hopkirk, and R. E. R. Grimmett. (1938.) *N.Z. J. Agric.*, 56, 21.

"Liver-fluke in New Zealand Sheep." W. V. Macfarlane. (1937.) *N.Z. J. Agric.*, 55, 274.

"The Effect of feeding Excess of Cobalt to Healthy Sheep." S. W. Josland. (1937.) 19, 31.

"The Rate of Excretion of Cobalt by Sheep after Drenching with Cobalt Chloride." H. O. Askew, and S. W. Josland. (1937.) 18, 888.

FIELDS DIVISION.

REPORT OF R. B. TENNENT, DIRECTOR.

The Season.

The general weather conditions experienced during the twelve months ended 31st March, 1938, varied considerably during the various seasons in the main agricultural districts. In brief, the outstanding features were as follows in the various areas under the Fields Superintendents :—

Northern Half of North Island.—The rainfall generally was slightly below the average. There were three prominent dry spells : an early dry spell in October checked the spring flush, a second dry spell in January dried out the pastures, and a further dry spell in March gave every indication of having a serious effect on winter feed. However, heavy rains from the end of the month onwards brought away a great flush of pasture growth.

Southern Half of North Island.—The year was notable for the very favourable winter and spring and high summer temperatures. There was rapid variation from dry to wet conditions, and *vice versa*, in many districts during the late spring, summer, and early autumn. Generally speaking, the year's weather was very favourable to crops and pastures.

Northern Half of South Island.—The weather throughout this area showed remarkable variations. The late autumn and early winter of 1937 were wet. No great quantity of rain fell, but the broken weather was of a continuous nature. In all districts from early in September until the beginning of December conditions were very dry and crop failures were common. Subsequent to early December the rainfall in all parts of South Canterbury, except the Waimate district, was quite abnormal—in some localities more than half a year's normal rainfall fell in a period of about seven weeks.

Southern Half of South Island.—Weather conditions were in marked contrast to those of 1936–37, being just as dry as the previous season was wet. Generally a fairly good winter was experienced, and in most districts a good early spring resulted. In North Otago, however, the winter was dry, and this dry weather continued right up until mid-December, by which time conditions were serious. Good rains from mid-December were experienced, and from then on occasional rain with high temperatures resulted in wonderful summer and autumn growth. In marked contrast the rest of Otago and Southland had a good spring, but dry weather with abnormally high temperatures were experienced from New Year onwards, and this class of weather still persisted at the end of the year under review.

Survey of Drought Conditions.

Two definite surveys were deemed necessary during the past twelve months on account of the feed position due to drought conditions. In early December a survey was made of North Otago, and the granting of assistance considered. Fortunately, the weather broke in mid-December and little assistance was necessary, although some farmers sent stock out to agistment and brought extra fodder in. In the late autumn a similar state of affairs existed in South Otago and eastern Southland. A survey of this area was made, and figures obtained with regard to the outward movement of stock. The position being found serious, stock and fodder freight concessions were granted on certain conditions. In all probability the assistance necessary will not amount to a great deal as most farmers are meeting the position by selling the stock that they would otherwise carry through the winter. The outward railage of stock has been abnormally heavy, but the bulk of these have either been sold in the district or are being trucked out to sales in districts more favourably situated as far as feed supplies and prices are concerned. In a few cases stock are being railed out for the purpose of grazing and will be returned in the spring of 1938.

Arable Crops.

Conditions generally for cereal crops were very mixed throughout the main cereal-growing districts. So far as the northern half of the South Island was concerned early-sown crops, except in the northern part of North Canterbury and Marlborough, went into rather wet and cold soil, with the result that many thin crops were produced. Numerous complaints received from farmers about their crops were investigated, and while in some cases the unfavourable condition of the soil was responsible for the poor, thin growth, in many other instances faulty seed was responsible. The faulty seed was procured from crops gathered with the header-harvester, and germination ranged from practically nil to 28 per cent. On the other hand, some quite good header-harvester seed was on the market, and carelessness in handling was responsible for the low germination in most cases.

So far as Otago-Southland were concerned, the drought conditions in North Otago seriously affected growth, and, further, many crops were of necessity, fed off. In the rest of Otago and in Southland more seasonal conditions during the growing-period were reflected in much better crops.

With respect to yields, that portion of the wheat crop threshed during the January–March, 1938, period, and amounting to 3,802,401 bushels, gave an average per-acre yield of 32·85 bushels, as against an actual yield for the 1936–37 season of 32·32 bushels. Although the average yield for the January–March period approximated the actual per-acre yield for the whole of the previous season, the total quantity of wheat available from the 1937–38 harvest will show an appreciable drop on the quantity secured from the 1936–37 season owing to the decrease in the area sown to wheat. The threshings of wheat up to the end of March accounted for 115,736 acres, of a total estimated of 188,000 acres in wheat for threshing. It is apparent that the wheat yield from the 1937–38 harvest will fall far short of the Dominion's normal requirements, and corresponding importations will be a necessity.

The oat crops in general were lighter than in the previous season, but even so reasonably good yields have been obtained from the crops threshed to the end of March. The estimated area sown to oats for the 1937–38 season was 285,600 acres, as against an actual area harvested the previous season of 315,704 acres. Threshings for the January–March, 1938, period disclose a per-acre yield of 46·69 bushels, as against an actual yield over the whole Dominion for the 1936–37 season of 48·00 bushels. Up to the end of March, 1938, the returns show that 33,164 acres of oats have been threshed for a total yield of 1,548,294 bushels.

As regards barley, it is estimated that 30,500 acres were sown for the 1937–38 season, as against an actual area harvested the previous season of 25,512 acres. The yield of barley has been high and the grain generally of good malting quality. The great bulk of the Dominion's barley crop is for malting purposes, and the increased area sown was the result of the Department's endeavours to have grown in the Dominion sufficient barley for full requirements. This position has not yet been attained, but efforts to achieve the desired end will not be relaxed.

The area in potatoes in 1937–38 was estimated at 21,700 acres, as against an actual area for the Dominion for the previous season of 22,462 acres. The crop promised the heaviest yield of recent times, and it was estimated in January that there would be an exportable surplus of from 40,000 tons to 50,000 tons of table potatoes. Towards the end of January, however, there was a slight appearance of late blight, which spread rapidly in February, cutting down many of the crops of the later varieties long before maturity. It is anticipated that digging of the crop will be possible of commencement about a month earlier than usual.

The potato-certification scheme maintains its popularity and has continued to justify its existence.

The 1936–37 potato crop was a praticularly heavy one, and it was fortunate for growers that a good market was found in South America. A total of 20,690 tons was exported, this including 310 tons of New Zealand Government certified seed potatoes. Particular attention was paid to the latter, which were all picked over in store under the supervision of divisional officers. It appears probable that the trade in seed potatoes to South America will be of increasing importance, and a comprehensive study of the position, particularly in regard to varieties most acceptable to South American growers, is urgently required. Certain varieties at present unknown in New Zealand might be introduced and grown with special technique definitely as seed-potato crops for this export trade.

The question of export of potatoes to other countries has also received attention, the most hopeful outlets being Fiji, the West Indies, and Singapore.

Amended regulations relative to the export of potatoes have been drawn up specifying a very high standard in regard to freedom from diseases, and also from insect damage, and providing for export only in new sacks of uniform size and branding.

Crop Utilization.

During the year a new section of the Division was set up to give close attention to such matters as various aspects of crop improvement, including introduction of new crops or new varieties, extension of the growing of certain crops, publicity, and general education work directed towards furthering technical improvements in crop production; studies of marketing problems, including grading and packing of produce; the administration of regulations, which are designed to bring about more orderly marketing of crops. The need for closer attention to the matters indicated was very real, and undoubtedly the inauguration of the section in question will fill a long-felt want and be found of great assistance in certain aspects of the Department's work.

Onions.

My division of the Department is charged with the administration of the Board of Trade (Onion) Regulations, which aim to provide for improved grading and more orderly marketing of this crop. The 1937 regulations were introduced at a period when the Canterbury growers were meeting the difficulties of marketing a large crop of poor keeping-quality. Minimum prices were fixed by the regulations, and in order to establish these prices authority was secured to purchase up to 300 tons of onions. However, on account of the difficulty in securing first-grade lines, only 100 tons were purchased, and even these showed a heavy wastage in store and necessitated considerable expense in picking over. These onions were later marketed by consigning to Wellington and Dunedin.

Onion-growers in the North Island were well satisfied with the operation of the regulations in 1937, but Canterbury growers requested certain modifications, which were incorporated in the amended regulations for 1938 and approved by a meeting of Canterbury growers held on 3rd February.

Under the 1937 regulations two Marketing Advisory Committees were set up, one for each Island, but these have now been merged and function as a Central Committee.

Supervision of importation of onions has also become necessary as a protection to local growers, and the importation of Victorian onions in August and September last was carried out by the Department. This proved most satisfactory to merchants and consumers.

Importation of Grain, By-products, and Seeds.

Since the enactment of the Customs Import Prohibition Order, 1937, the Minister of Customs has been acting on the recommendation of this Department when issuing permits for importation of certain grains, seeds, and feeding stuffs. Permission to import subterranean-clover seed is now given only in production of a certificate that the seed has been fumigated by the hydro-vacuum process. Feed grains are admitted only when accompanied by a certificate of origin showing the grain to have been grown in a district free of cattle-tick and of transmissible stock diseases.

Feed Barley.

This grain has been available at low prices in South Australia, and since it is admitted duty-free to New Zealand it has become of increasing importance as a poultry-food grain, and is likely to be imported in large quantities during the present year. Merchants' business in importation was facilitated by the granting of provisional permits for the period 1st January to 30th June, during which authority was actually granted for the importation of 124,000 sacks.

Malting Barley.

The first meeting of the Barley Advisory Committee set up by the Hon. the Minister of Agriculture was held in Christchurch on 18th and 19th May, 1937, and two subsequent meetings of this Committee have been held. It was also decided to set up a Barley Specialist Committee to advise on technical matters, and this Committee has held three meetings.

A good deal of progress has been achieved in the establishment of official grading standards, agreement as to the prices for the various grades, extension of barley acreage, and experimental work in regard to ecological, varietal, manurial, and maturity trials. Full co-operation has been secured from the Agronomy Division, as well as from barley-growers and from maltsters. Special thanks are due to the Canterbury Seed Co. and New Zealand Breweries, Ltd., for assistance, particularly in the testing of barley samples for malting-quality.

The Barley Advisory Committee includes representatives of growers and maltsters, as well as three representatives of this Division. It must be given a certain measure of credit for the satisfactory state of the barley-growing industry at present, as it now appears that New Zealand is once again well on the way to supplying the whole of the local requirements of malting barley.

Maize.

Owing to over-importation during the period March–July, 1937, and to the competition of cheaper grains, difficulty was experienced by maize-growers in marketing their 1937 crop maize. A good deal of consideration was given to arriving at the best solution of the difficulty, and, following a deputation of maize-growers to the Hon. the Minister of Marketing, a meeting of growers was convened at Gisborne on 24th February, and the matter was satisfactorily settled by the establishment of a minimum price f.o.b. Gisborne of 5s. 3d. per bushel by arrangement between merchants and the Director of Internal Marketing acting in conjunction with officers of this Division. Close touch is being maintained with the progress of marketing of the old crop maize, and the question may require further action when the new crop becomes available.

Agricultural Instruction and Extension Service.

An endeavour has been made to keep this work well to the fore with a better degree of success in some districts than during the past season or two on account of increased staff. The bulk of the instructional work is carried out by personal visits to the farm. This service is appreciated, and most officers have a waiting-list of farmers who have made application for a personal visit. Unfortunately, where such a waiting-list is in existence it is not possible to do much in the nature of "follow up" visits, but where time and opportunity occur officers revisit farms to further assist farmers.

Experimental Farms and Areas.

The seven experimental and demonstration areas scattered throughout the Dominion continue to be of value to the agricultural community. In the majority of these farms they are not controlled by the Department, but in each case by a society of agricultural interests in the respective districts. In consideration of the useful demonstration work conducted, however, the Department makes an annual grant in respect of each area to the body responsible for the conduction of the place. I reported on a previous occasion that a great deal of the work carried out on these farms is of an intensive technical nature and is performed in close co-operation with specialist officers engaged in grassland research. This position continues.

Last year I reported on the need for an experimental farm in the South Island. This matter has not been overlooked, but during the year has been closely investigated from all angles. It is anticipated that a comprehensive report will be submitted shortly for the favourable consideration of the Government. I feel sure the sound evidence being brought forward will clinch the position, and that the desired experimental area will before long be established.

Ruakura Farm of Instruction.

Pastures and Crops. No difficulty was experienced during the spring in controlling the pasture growth. Although there was no actual shortage of feed, pastures were not nearly so productive as is usually the case from September to January in average seasons. Three hundred and thirty-nine acres of pasture land was top-dressed with superphosphate and 9 acres with nitrogenous manures. Fourteen acres were specially top-dressed to control the flavours in milk and cream. A number of the dairy fields had to be topped to prevent the grass from becoming too rank. This phase of grassland work was, however, much lighter than it was last year.

Much better weather conditions prevailed for harvesting, a large quantity of the hay being baled straight from the windrows. One hundred and thirteen acres of grass was converted into hay and 2 acres into ensilage, producing approximately 174 tons of hay and 20 tons of ensilage.

Milk-production Herd. To carry out experiments to ascertain, if possible, the cause and control of feed taints in milk and cream, a small one-cow plant dairy was erected in Field 18A, an area of 14 acres, which was subdivided by fencing into twelve small fields. Fifteen cows were placed there and milked for the season.

No cows were put under herd-test of any description during the year. A milking control was instituted to lessen, if possible, the incidence of mastitis. The herds were divided into three groups according to the intensity of the infection and kept as separate herds for the whole of the season. The results can be classed as very fair. Very little trouble was experienced at calving-time.

The electric steam sterilizer and water-heater installed at No. 1 dairy has continued to give satisfaction and the grading of the cream has kept up to "finest" consistently, despite the hot, sultry summer, and autumn. An alteration was made in the water service so far as to link No. 2 dairy up with the main supply from the reservoir, resulting in a continuous supply of good water right throughout the summer.

Southdown Sheep.—This flock was handled in similar lines to last year. One hundred and forty ewes were selected and mated to three rams, one bred by C. J. Hawken, one bred by J. H. W. Slack, and one bred on Ruakura.

The following rams were sold during the year:—

1 stud shearling ram	.. ..	14 guineas.
24 flock shearling rams at an average of	.. .. ..	3 guineas.
15 flock mixed-age rams at an average of	.. .. ..	2·88 guineas.
40		

The year closed with the following sheep on hand: 139 breeding-ewes, 3 stud rams, 47 flock rams, 53 ram lambs, 47 ewe lambs: total, 289.

Crossbred Flock Sheep. The year commenced with the following sheep on charge: 1,947 breeding-ewes, 65 stores for killing, 27 store lambs: total, 2,039.

An abundance of grass was available for the ewe flock during the autumn and winter. All the ewes, with the exception of a number of those purchased from Wairoa during the previous February, did well and produced a big percentage of lambs. The bought-in ewes did not flush up too well, and their lambing percentage was very low. Feed did not grow so freely during late spring and summer, and the lambs were much later in maturing than is the case in better seasons. The average weight was also below the usual standard for this farm. One thousand six hundred and ninety-five lambs were sold for export, realizing £1,815 1s. 11d., at an average price of 21s. 5d.

Breeding-ewes were extremely hard to procure again, and the prices they were realizing at the various fairs were extremely high. Six hundred and seventy, including 320 two-tooth ewes, were purchased at an average price of 32s. 10d. per head. One thousand nine hundred and sixty-eight ewes were placed out with the Southdown rams during February. The year closed with the following sheep on hand: 1,968 breeding-ewes, 53 culled ewes to fatten, 38 fat sheep for killing, 73 store lambs, 2 romney rams.

Wool sold during the year was 48 bales for £630 16s. (£13 2s. 10d. per bale), as against 43 bales last year for £953 8s. 4d. (£22 3s. 6d. per bale).

Beef Cattle.—The Polled Angus and Polled Angus-Hereford cross cows have bred very satisfactorily. The progeny of the 105 heifers purchased in February, 1936, now total 100 plus 28 sold as yearlings. Sixteen steers, calved in December, 1936, and January, 1937, and 17 calved during July and August, 1937, were selected for experimental purposes, and their daily weight-gains checked by weighing twice monthly. All animals made satisfactory progress until the extremely dry weather set in last January. Since the autumn rains came and good grass growth started they have commenced to do well again.

On 7th June last nine Polled Angus eighteen-month-old steers of good type and conformation were purchased for £50 off a run for the purpose of fattening on grass and testing their weight-gains over a period of four to five months. The results were extremely gratifying, the daily body-weight gains being remarkably good. Four animals from this group were selected as being of suitable type for the chilled-beef trade and were entered in the chilled-beef class at the Waikato Agricultural and Pastoral Association's Show held at Claudelands during last October. None of these animals gained a place on the hoof at the show, but two were placed first and second on the hooks at the Horotiu Killing Works three days later. The carcasses were then forwarded to Smithfield, London, to compete for the Borthwick Cup, but were not placed.

A new bull from a good strain was purchased last spring for £37, and one that was not leaving good type calves was sold. It is the intention to purchase from Flock House early in the coming year thirty heifers and a bull of good type.

The following cattle were on charge as at 31st March: 2 bulls, 100 cows, 24 yearling heifers, 33 yearling steers, 43 calves: total, 202.

Annual Sale.—As has been the custom for the last few years, all yearling and maiden two-year-old bulls were sold by auction at the Waikato Combined Breeders' Association sale. Twenty-seven yearling and two-year-old bulls were disposed of at an average of £19 10s. 2d., realizing £562 13s. 7d. Both Ayrshire and Shorthorns were again in demand. The sale for Jerseys was not too brisk. Any bulls that were offered but did not sell at the sale were disposed of later by private treaty.

Pigs.—Pedigree breeding of boars and sows for sale to the public was carried on on similar lines to previous years until July, when it was decided to discontinue pedigree breeding and concentrate entirely on research work in pork and bacon production. All surplus animals not required for this particular work were sold by public auction.

To cope with the volume of experimental work planned, and to enable the experiments to be carried out in similar, if not identical, conditions adopted by the more progressive pig-farmers, it was decided to discontinue using the big concrete pig-house at No. 1 piggery and adopt the open-air system entirely. With that object in view a new lay-out has been partially built in Field 25 opposite the No. 1 dairy. As much as possible of the old material (houses, posts, wire, &c.) is being utilized, and any old buildings now unfit for the purpose originally built on other sections of the farm have been converted into pig-houses. Fair progress has been made with the work, but a large amount still remains to be done before the whole lay-out will reach the extent desired.

All our experimental baconer pigs are purchased by Messrs. J. C. Hutton (N.Z.), Ltd., at Frankton Junction at ruling market prices. They allow us to inspect all the carcasses on the hooks and allow us to take all measurements and perform what tests we require, even at times when it is somewhat inconvenient to themselves. For affording us such facilities and consideration I desire to place on record my thanks and appreciation.

Poultry Section.—During the year preparations have been made to lay down an experiment to demonstrate the value of curd as a poultry-food. One hundred White Leghorn pullets were purchased and equipment prepared for an early start in the forthcoming year.

Feed-flavour Investigation.—Towards the close of the 1936–37 dairying season the co-operative experiments in the feed-flavour investigation were discontinued. Since then the Divisional officers have kept in touch with the farms concerned so as to maintain the interest of farmers. These co-operative trials showed that clovery pastures give the strongest feed flavour and grassy pastures the least; that artificial nitrogenous fertilizers will not change clovery pastures to grassy pastures unless suitable grazing management assists; by suitably controlled grazing management of pastures the desired change could probably be made without recourse to expensive artificial nitrogen. It is obvious that a more complete knowledge of the fundamental principles governing controlled grazing of pastures with predetermined ends is essential before further progress is possible, and accordingly the feed-flavour investigation has developed into a study of the technique of pasture control and its effects on the sward.

Grazing Trials.—During the winter of 1937 a field of about 14 acres was taken over at Ruakura and subdivided into a dairy-farm of twelve fields each 1·05 acres in grazing area. The farm is typical of dairy-farms in Waipa, Waikato, and Piako Counties where feed flavour gives more trouble than in most other parts of New Zealand. The soil is a complex of Horotiu and Te Kowhai loams, and the pastures when taken over were typical of those pastures in the district which give strong feed flavours. A milking-shed has been built on the farm and a herd of fifteen cows are grazed and milked. Their cream at each milking is critically graded for flavours by an officer of the New Zealand Co-operative Dairy Co., under the supervision of officers of the Dairy Division. Pastures are differentially grazed and manured. The results of the trial so far are: On a broad basis, pastures can be deliberately changed to a predetermined production-composition; control of the grazing, particularly in the winter and early spring, has a stronger influence on the composition of subsequent pasture production than any other factor of management; big changes can be made by wisely controlled grazing alone. Fields leniently grazed throughout have become grass dominant; fields hard-grazed throughout are clover dominant.

Live-stock-feeding Experiments.—The live-stock-feeding experiments at Ruakura were controlled by a committee comprising members of Live-stock and Fields Divisions— viz., District Superintendent, Fields Superintendent, Farm Manager, Extension Officer in Pig Husbandry, Poultry Instructor, and Veterinarians and Fields Instructor, Hamilton, and Assistant Experimentalist, Ruakura. Very little live-stock-feeding work has been carried out in New Zealand, and a complete study of the results of feeding trials and trial technique is necessary to put live-stock-feeding work in New Zealand on a proper footing. The live-stock experimental work at Ruakura is rapidly expanding to embrace all classes of live-stock—cattle, sheep, pigs, and poultry—from the nutritional point of view.

Cattle-feeding.—Trials in the production of chilled beef have been continued. One aim of the investigation is to vary the date of calving in order that calves will be born when there is a surplus of grass which is not required for sheep feed; late calves have been wintered on their dams and weaned in the spring. Information on the rate of growth at various periods of the year is being obtained, and an endeavour is being made to formulate a standard of carcass measurement for the correct type of carcass for the chilled-beef trade. Dr. Hammond, on his recent visit, promised co-operation and to report on carcasses sent Home from Ruakura.

The influence of nutrition on dairy-bull sterility is being studied. Twenty-four bulls, in four groups, have been placed on experimental rations from weaning onwards, and the rations vary widely in their protein and carbo-hydrate content. One of the groups will be stall-fed under European conditions of feeding.

Pig-feeding Experiments.—The experimental work with pigs at Ruakura is now fairly comprehensive and deals with all aspects of the pig's life. A new piggery for experimental work has been erected and will be completed during the coming year. This new piggery is designed to facilitate the weighing and management of experimental pigs.

The influence of nutrition on the pregnant sow is now under investigation, and twenty-four sows in four groups will be specially fed over various parts of the gestation period. One group will be run under conditions typical of many farms where the methods of feeding are inadequate. These groups will form the basis of comparison for differences in birth-weights, litter-numbers, mortality, weights at weaning, &c.

An investigation into the relative value of the feed-stuffs commonly fed to sucking-pigs is in progress. Trials were commenced in the spring, when a number of litters were fed from specially constructed self-feeders. All feed-stuffs were measured and free access given to the rations fed. The trial will need repeating before definite conclusions can be drawn, but it was found that excellent weaning-weights (40 lb. and upwards) were obtained with separated milk only, separated milk and a small quantity of

whole milk, and separated milk and curd. In trials with a free choice of dry meals and separated milk the young pigs consumed two-thirds of the total feed as separated milk. This emphasizes the necessity of providing separated milk in creep feeding to obtain good litter weights at weaning.

Winter-feeding trials are being continued, and the results of the 1937 trials were published in the *N.Z. Dairy Exporter*, November, 1937. The trials investigated the value of farm-grown crops—swedes, mangels, pumpkins, and maize—as winter feed for store pigs. The roots, &c., are fed with varying quantities of meat-meal and the results carefully examined from the cost point of view.

The recent introduction of the grading of bacon carcasses on the thickness of back fat will necessitate an alteration in the practice of full feeding separated milk over the latter part of the fattening period, in order to reduce the thickness of back fat. In all countries where high-grade bacon is produced some degree of restriction is imposed. This is done either by restricting the amount of concentrates or by replacing them with a more bulky ration. Roots are commonly used for this purpose. This is of considerable importance in New Zealand, especially so since many of our bacon pigs are wintered in store condition. Pigs subject to this treatment are extremely liable to become excessively fat if "full fed" separated milk in the spring. Pigs born in the spring and fattened without a store period appear less liable to become excessively fat, but should also be restricted over the latter part of the fattening-period. A number of trials have been conducted with both spring and autumn litters, and the reduction in back fat was very satisfactory. Full fed pigs graded only 40 per cent. No. 1 Prime, whereas pigs with restricted rations graded 80 per cent. to 100 per cent. No. 1 Prime. The use of roots as part of the restricted ration or for early spring fattening has been very satisfactory. Fifty per cent. of the fattening ration has been fed as roots, and a good rate of fattening maintained and excellent carcasses produced.

Many persons maintain that the quality of fat in bacon pigs is greatly improved if small quantities of meals are fed with separated milk, compared with separated milk alone. An extensive programme of trials has been drawn up to investigate this point, and bacon pigs will be fattened on small quantities of meals fed in conjunction with separated milk. The carcass fat produced will be examined by chemical and physical means for differences in quality. As a basis of comparison pigs are being fattened on a ration similar to that used in Britain and upon which good-quality fat is said to be produced. Other factors, such as rate of growth and stying versus open-air methods of fattening, are being investigated.

Cobalt Top-dressing.—A trial to investigate the possibility of cobalt deficiency in the pastures at Ruakura is being carried out. At present lambs fatten satisfactorily on the farm, but possibly the addition of a cobalt top-dressing may improve the growth rates. Comparable fields will be top-dressed, one with superphosphate plus cobalt and the other with superphosphate only. Suitable groups of ewes will be grazed under "set" stocking and the excess of growth controlled with cattle. Periodic weighing of ewes and their lambs will be carried out.

Ruakura Farm Training College.—Once again I regret having to report the attendance at this college is disappointing. The main reason is thought to be the shortage of labour on the farms throughout most districts and the resultant natural desire of parents that their lads remain at home.

The alteration of the course of study from eighteen months to one of twelve months' duration, embracing two instead of three terms, appears to have achieved its main object. Whereas previously only about 40 per cent. of the students enrolling completed the course, all of the junior students in the term ending June, 1937, returned as seniors and completed their course of training in December, 1937, and all but one of these qualified for the final certificate. All of the junior students attending in June–December, 1937, have returned for the second half of the course, January–June, 1938. From this it appears evident that the students appreciate the instruction given, and it is satisfactory to note that the great majority of students now being turned out will have had the benefit of a complete course of instruction.

During the past year a systematic course of lectures has been given in each of the following subjects: Farm Management, Dairy Farming, Pastoral and Mixed Farming, Crop Production, Pasture Production, Breeding of Live-stock, Farm Forestry, Soils, Farm Mathematics, and Farm Accounts.

Special Farm Schools.—Two special courses of instruction were arranged during the winter, 21st–25th June and 28th June–2nd July. Both of these were very well attended—there being a total of ninety students—and many of those present had previously received instruction at the classes held on the farm in 1935 and 1936.

The courses were arranged to cover all the different aspects of pig-management on dairy-farms, and a series of lectures was interspersed with demonstrations at various piggeries in the district. Lectures were also given on the establishment and management of pastures, scrub-land development, use of fertilizers, farm shelter, implements and cultivation, young farmers' clubs, and farm drainage.

Demonstration and Trial Plots.—These have again proved of considerable value from an instructional point of view, and have been extended to include a representative series of ocular demonstrations of seed-mixtures, strains of grasses and clovers, the establishment of different types of pastures, and the effects of varying manurial treatments.

Variety and manurial trials have also been carried out with soya beans, maize, millet, and each of the more commonly-grown farm crops.

In view of their high educational value in emphasizing and reinforcing the lessons of the class-room, it is proposed to increase the area devoted to demonstrational plots during the coming year.

Flock House.

This property, acquired by the Government in February, 1937, was conducted during the year along much the same lines as hitherto. The main object of Flock House is for use in the training of lads in agriculture. A maximum of approximately fifty lads can be satisfactorily accommodated,

and no difficulty has been experienced in keeping the place full to capacity. The routine followed is that the lads, who must be between the ages of fourteen years and a half and eighteen years at time of entry, are given one year's training in all branches of agriculture and are then placed in employment with approved farmers. During the period under review the health of the boys generally has been good.

The farming operations at Flock House during the year are reported on below suitable headings :—

Sheep.—Sheep, generally, have been maintained in good condition throughout the year. The prolonged dry summer caused a certain amount of anxiety, particularly as regards water, the property being largely dependent on mills for its supply.

Carrying on with the policy in the past of gradually increasing the breeding-stock in accordance with land improvement, a further 300 ewes were put out to the ram this season, making a total of 6,460.

Mortality has been more or less normal : Ewes, 4·4 per cent. ; Hoggets and lambs, 8·8 per cent.

Lambing percentages were slightly below average.

The first draft of 310 lambs was got away on 26th November, at an average price of 26s. 10d. Subsequently drafts were got away at approximately monthly intervals, those after the end of January being shorn. The total number to date is 3,060, at an average of 20s. 6d. per head.

Except early in the season, lambs have not fattened as well as usual. Rape was rendered quite useless and chou moellier to a lesser degree, owing to ravages of the white butterfly.

Wool.—Crutching was done during the last week in May, eleven bales being disposed of at Wellington, on 3rd and 12th August, at an average price of 12¼d. for six bales, while five bales of scoured brought 14½d.

Shearing of dry sheep was completed early in November, and the main shearing was started on 15th December and completed on 31st idem. A total of 222 bales was pressed, with an average weight of 372 lb. Thirty-three bales of pieces, bellies, and locks were sent for scouring, and were ultimately shipped to London for disposal, the balance of the clip being disposed of at Wellington.

Per head averages were as follow :—

Wet ewes (December shearing)	10·9 lb.
Dry ewes (October shearing)	9·2 lb.
All ewes	10·7 lb.
Hoggets (shorn as lambs)	4·9 lb.

Run Cattle.—Cattle generally have been maintained in satisfactory condition throughout the year, though the question of water was acute at times, owing to the exceptionally dry summer. In this connection it is intended to install probably two more mills, with storage tanks, before next summer.

Breeding-cows have not been carrying quite the usual condition this season, but calves are well up to average in quality and condition.

Dairy Herd.—The dairying area adjacent to the homestead has been maintained in good heart throughout the season, though pastures suffered to a certain extent during the prolonged dry spell. A supplementary ration of ensilage was available over this period.

Pigs.—Purchases of six pure-bred Berkshire sows and one Tamworth boar have been made from the stud of Mr. J. A. Russell, "Blythewood," Palmerston North, and our breeding-herd will be built up from these, which were tested and proved free from T.B. before coming on to the property.

During the year a total of 141 pigs were sold as baconers and porkers.

Agriculture.—Teams have been engaged throughout the year in general routine work in the growing and harvesting of oats, wheat, peas, potatoes, swedes, chou moellier, rape, millet, ensilage, and both lucerne and pasture hay. Oats, grown wholly for chaff, suffered considerably as a result of the dry weather, while rape, swedes, and chou moellier were badly ravaged by white butterfly, swedes being rendered almost a total failure, and rape being quite unfit for feeding lambs. Other crops were well up to average.

Sixty-four tons of fertilizer were applied in the top-dressing of pastures.

A considerable amount of general carting was also done in the form of trees, firewood, fencing-material, metal, &c.

The tractor has been engaged in ploughing of new ground (approximately 100 acres), surface draining, working up ground, pressing hay, and threshing.

Sufficient new country is being developed to work in with the breeding of our own stock, allowing for an annual increase of 200 to 300 breeding-ewes.

Horticulture and Forestry.—A total of 70,000 trees were planted out as follows :—

Pinus insignis (sandy run)	55,700
Pinus insignis (home planting)	2,800
Macrocarpa (home planting)	11,000
Eucalyptus and silver poplar (home planting)	600

Approximately 45,000 *Pinus insignis* and 15,000 macrocarpa seedlings were planted out in the nursery and approximately 40,000 seedlings raised from seed.

In addition to planting on the sandy run, any areas elsewhere on the property, which are never likely to be of any value from a grazing point of view, are gradually being fenced off and planted in trees. Further shelter-belts are also being planted every year.

Flooding and River-protection.—Though the river was running bank-high on a number of occasions, comparatively little flooding of pasture occurred. Considerable damage was done on several occasions

to protective work on the bad bend at the lower end of the property, necessitating practically a complete renewal of the fascining of the bank with willows, in addition to re-erecting the stock fence further back, owing to bank-erosion.

A proposed cut through the low-lying ground on the opposite bank would give relief of a constantly-recurring expense in renewing protective work and prevent a decided menace to established work down-stream.

Field Experiments.

The total number of field experiments conducted by officers of the Fields Division was 984, compared with 955 carried out during the previous year. Most of these experiments were on the properties of selected farmers, while the remainder were located on experimental or demonstrational farms. Many of the projects were carried out in collaboration with the Plant Research Bureau or with the Wheat Research Institute. A close degree of co-operation with these organizations is necessary so that the results of fundamental research work may be followed up by field experiments, and this is mainly brought about through various committees of research workers and extension officers.

Description and Progress of Experiments.

1. *Grassland.*

(*a*) *Yield Trials under Mowing and Grazing Technique.*—At Marton Experimental Area six experiments are being conducted under this heading, and the scope of these was referred to in the last annual report. One of the experiments referred to previously—viz., a trial with different cocksfoot strains—has been finalized recently.

At the Ruakura Farm of Instruction three mowing and grazing trials, one on each of the three major soil types of the middle Waikato basin, are being continued, and these investigate the effects from lime, phosphate, and potash respectively. The response to date from superphosphate on limed ground has been just about double that from super on unlimed ground. As the experiments were laid down on newly-sown pasture and the results quoted above are not substantiated by observational trials on old pasture, a further experiment to investigate the effect of lime on newly cultivated soil as compared with undisturbed soil is now in progress. The general technique of mowing and grazing trials, particularly the alleged disturbing influence of transference of fertility from one plot to another, is to be tested in a new experiment. In addition to the above, a modification of the mowing and grazing technique has been adopted to measure the influence of cultivation on a sod-bound sward of paspalum.

(*b*) *Observational Top-dressing Experiments.*—The survey of fertilizer responses on grassland is being continued, and in those districts which have been covered by the soil surveys plots are being established on each major soil type. Although the effect of phosphate, potash, and lime is the chief object of these investigations, most of the experiments are designed to compare various forms of phosphate in addition. It has not so far been possible to include "Heskett" slag on account of supplies of this material not being available.

(*c*) *Demonstrations and Trials of Grass and Clover Strains.*—These trials, which are carried out in collaboration with the Grasslands Division of the Plant Research Bureau, continue to provide valuable demonstration areas to farmers, and they also serve as experiments to investigate the behaviour of the new pedigree lines of grasses and clovers under various climatic conditions.

(*d*) *Grazing Trials.*—Of the six grazing trials carried out, two in Taranaki are designed to compare production from fields treated with potash as against fields not receiving potash. The remainder investigate production of rye-grass strains under grazing.

One of the latter, established at Winton Experimental Area, compares production of wool and lamb from fields sown with better-type Southland seed with production from certified rye-grass fields. The outstanding feature of the first year's results was the higher carrying-capacity of the certified rye-grass areas, and this represented a monetary gain over the Southland rye-grass of at least 33 per cent. from wool and lamb actually sold.

(*e*) *Clover-inoculation Trials.*—Trials carried out in collaboration with the Field Mycologist of the Plant Research Bureau investigate the value of inoculating white clover and also test out different strains of culture in various parts of New Zealand.

(*f*) *Subterranean Clover Experiments.*—Eighty-one experiments are being carried out with subterranean clover to determine the utility of various strains and also to investigate the possibilities of surface-sowing of this species on hill country. The failure of the Dwalganup strain in all districts where it has been tried so far has been one of the features of the experiments. It has also been indicated that in Central Otago subterranean clover is unable to thrive under extreme dry and cold conditions, but further experiments which have been laid down will enable the exact climatic range of this species to be determined.

(*g*) *Investigations into Effect of Pastures on Feed Flavour.*—This work has been consolidated at Ruakura, although some of the Morrinsville pastures on which experiments were previously carried out are being kept under observation. The past season was not generally conducive to feed flavours arising from pastures, but valuable data has been secured from the grazing experiment at Ruakura in regard to the effects of pasture management and manuring on changes in sward composition. Following work conducted by the Dairy Research Institute, which suggested that feed flavours can be much reduced by removing the herd from grazing three hours before milking in the afternoon, information has been sought regarding the effect of this procedure on production. At the Waimate West Demonstration Farm an experiment conducted with two herds, one being removed three hours before milking and the other normally treated, indicated that no loss in production need be anticipated by adopting the procedure suggested.

2. *Cereal Crops.*

(*a*) *Wheat Manuring.*—In the spring of 1937 several wheat crops exhibited the stunted and yellow condition which is usually associated with nitrogen starvation. On five of these, experiments were located to investigate the effect of applying 1 cwt. sulphate of ammonia. The average increase in yield brought about by this treatment was 5½ bushels per acre. Two experiments were laid down to ascertain the effect of increasing superphosphate applications from 1 cwt. to 2 cwt. on limed land, but in neither instance did the greater quantity give any significant increase in yield over 1 cwt. super.

(*b*) *Wheat Varieties.*—Nineteen experiments with wheat varieties were carried out in collaboration with the Wheat Research Institute, but exceptionally dry conditions and other causes accounted for the abandonment of several before harvesting. The work was mainly concentrated on trying out in various districts some of the crossbred wheats evolved by the Wheat Research Institute.

(*c*) *Oat Varieties.*—In experiments conducted in the South Island during the past season the variety known as "Resistance" continued to show its superiority in yield of grain and chaff over other varieties, which included Algerian, Abundance, Black Supreme, Markton, and Huskless.

(*d*) *Barley Variety and Manuring Trials.*—Comparisons between the different varieties of barley under experimental conditions had not received attention until last season. Twelve experiments with varieties of barley, some of them combining varieties with differential manuring, were carried out. No striking differences were secured between the varieties in yield, but the malting-quality of the grain from the plots has yet to be determined. The use of superphosphate produced some outstanding increases in yield and in one experiment in Central Otago 1 cwt. super almost doubled the yield of the crop.

(*e*) *Potato Manuring.*—Ten experiments on potato manuring are being carried out in the South Island. These are designed to investigate the responses to phosphate, potash, and nitrogen, while some of them include treatments based on the new theory of potato manuring advanced by Truffaut in France.

(*f*) *Turnip Varieties: Manuring and Disease-control.*—Six experiments on the manuring of turnips have been laid down in the South Island. Variety trials have been established to obtain some information on palatability, together with the physical and chemical properties of different varieties. Various strains of club-root-resistant varieties are being tried out on land likely to be infected with the disease. The investigation into the effect of borax on brown-heart of swedes is being continued, and efforts are being made to find a suitable method of applying borax with fertilizer and seed without causing germination injury. The appearance on the market of two proprietary remedies for club-root have necessitated trials being carried out with these materials. Where club-root has been present neither of them have succeeded in controlling the disease, and as several tons of the so-called remedies have been sold to farmers in Otago and Southland it is probable that much disappointment will be experienced from the results secured. Farmers should be warned against using any specific for disease-control which has not been tried out experimentally.

(*g*) *Sugar-beet Experiments.*—Further trials are being conducted in the South Island and in Hawke's Bay to investigate the yields of sugar beet and approximate costs of production under New Zealand conditions.

3. *Miscellaneous.*

(*a*) *Pampas-grass.*—Continued observations have been made on many farmers' crops of pampas-grass, as well as on two experimental areas. Success with this species has been obtained on several farms in the North Island, whereas in the South Island only a few plants have generally survived after planting. Pampas-grass may prove particularly useful for wintering cattle on hill country on which the growing of normal supplementary crops is difficult, and several further experiments to investigate its possibilities in this direction are contemplated.

(*b*) *Ragwort-eradication.*—Problems associated with the control of ragwort are still receiving much attention at Ruakura and in the surrounding district. Much information concerning the life-history of the plant is being gained, while the treatment of the weed by chemical methods is under investigation in a large number of experiments.

(*c*) *Pig-feeding Experiments.*—During the past season valuable information regarding the feeding of pigs has been secured in the experiments at Ruakura Farm. Most of the results have been published in the *New Zealand Journal of Agriculture* and other periodicals.

(*d*) *Other Trials.*—Experiments with maize, soya beans, linseed flax, lucerne, and onions are among the many miscellaneous experiments being carried out.

Seed Certification.

The certification of seeds has continued to be a prominent activity of the Fields Division during the past twelve months. The ready reception in the seed trade and the farming community of any seeds carrying the hall-mark of the Government's seed-certification scheme is ample evidence of the value of such a scheme to those interested in the sale and use of high-quality seeds.

The operations relative to seed-certification have proceeded along lines closely similar to those adopted in the previous year, it having been considered unnecessary to introduce any material alterations in the general procedure being adopted. Similarly, the scheme has not been extended to include any further crops, though the possibility of development in this direction is at present under consideration.

Contract Growing of Pedigree Strains.—As more supplies of nucleus seed of pedigree or selected origin have become available extensions have been made in the areas sown out under contract to the Department. The areas coming under this heading in the 1937-38 season included: Perennial rye-grass, 35 acres; white clover, 46 acres; red clover, 3 acres.

Arrangements are now in hand for the sowing-down of further areas of each of the above seeds, while an area is also being sown to a specially selected strain of Italian rye-grass.

It is expected that over 100 acres will be harvested under contract in the ensuing season.

Additional to the above, the Canterbury Agricultural College is handling along similar lines, and under the supervision of this Department, the production of supplies of cocksfoot-seed of a selected strain.

The demand for seeds harvested from these special areas (certified Government stock seed) has been such that it has been found impossible to fill in their entirety all the orders received. Reports received during last season from those farmers who have established pastures with certified Government stock seed are all very encouraging, and a very bright future exists for seeds of superior strains.

Perennial Rye-grass.—A little under 8,000 acres of perennial rye-grass were entered for certification in the 1937-38 season, this being a slight reduction on the acreage entered in the previous season. A considerable increase is being shown, however, in the quantity of seed being accepted under the scheme of certification as "Commercial," where acreage figures are not available for comparison, and it is considered that over the whole of the 1937–38 season a definite increase in the quantity of perennial rye-grass seed finally certified will be recorded.

While in some localities, as was the case in the previous season, adverse weather conditions have resulted in a reduced acreage being harvested for seed purposes, the seed which has been obtained has, in general, been of higher germinating-capacity. Nevertheless, there is insufficient seed available to fill all requirements and the present supply of seed is very low.

A feature of this season's operations has been the availability for the first time of certified pedigree perennial rye-grass seed. This seed is the once-grown product of certified "Government stock" seed mentioned earlier. The several thousand bushels produced in this grade were rapidly adsorbed through commercial channels at premium prices, and served to a certain extent to allay the insistent demand for supplies of the higher grade of seed produced under contract. Nevertheless, the demand for certified "Government stock" seed still exceeds the supply, a quantity of over 1,000 bushels available from the 1937–38 harvest having already been absorbed by the orders received.

Cocksfoot.—A further increase has been shown in the acreage of cocksfoot-seed entered for certification, the figure for the 1937-38 season being 8,300 acres. The seed harvested is in much better condition than was the case in the 1936-37 season, no difficulty being experienced in dressing lines to the standard required for certified seed.

The production under certification of a selected strain of cocksfoot-seed has resulted in the placing on the market of commercial quantities of this superior strain. As in the case of perennial rye-grass, the seed is certified in one of two classes. One area passed certification in the Government stock seed class, while several other areas qualified in the pedigree class.

In addition to the usual identification of the particular type or strain, a high degree of freedom from rye-grass seed in the machine-dressed article is demanded before certification is granted in either of these classes. In the 1937-38 season it has been found necessary to degrade the produce of several areas on this one point of rye-grass impurity.

White Clover.—The certification of white-clover seed by the method introduced at the commencement of 1937 is being continued, the effect of the change being shown in a vastly increased quantity of seed being certified. During 1937, for instance, the quantity of seed certified under this method exceeded the total quantity previously certified during the eight years during which a certification scheme has been in operation.

In addition to the certification of seed in the mother and permanent-pasture classes as indicated above, a few areas sown out with certified Government stock seed have now qualified under a method of field inspection and sample testing for certification in a pedigree class.

The quantity of white clover-seed produced on contract to the Department in 1937–38 season was well below expectations. This has been occasioned by adverse seasonal conditions, and as a result it will be impossible to meet more than a small proportion of the inquiries received for certified Government stock seed. It is the aim of the Department to build up a reserve supply of this seed at the first opportunity in order to offset the occurrence of similar circumstances in future.

Red Clover.—The production under certification of Montgomery-red-clover seed has not progressed as was anticipated, despite a further substantial increase in the area entered, making a total of 1,200 acres under certification this season. Here again adverse seasonal conditions supply the reason for the small quantity of seed harvested. Continued wet weather in the principal seed-producing district—South Canterbury—has resulted in the almost complete inability to harvest a satisfactory seed crop. As a result mercantile firms have, of necessity, made recourse to the importation of seed of this strain from England to supply the demand which now exists in this country.

The certification of the broad red type of clover is at present receiving consideration, and preliminary work in this direction is being undertaken.

Brown-top.—Though the entries for brown-top certification are not yet complete, there would appear to be no great variation in the areas being harvested for seed. The certification of brown-top seed seems now to have reached a more or less stable level, and as no selection or breeding programme is under consideration it is not likely that any further developments will be made in respect of this seed for some considerable time at least.

Italian Rye-grass.—A further increase in the acreage entered for certification in the 1937–38 season is recorded, approximately 800 acres having been inspected with a view to certification. The general standard of the areas as revealed at field inspection seems to be improving, particularly in regard to the characteristic awns exhibited on good Italian rye-grass. This would appear to be explained by the elimination of the awnless types during dressing and the prevention, by an efficient scheme of certification, of recontamination with these types.

Phalaris Tuberosa.—A few areas of *Phalaris tuberosa* have again been inspected with a view to certification, but one cannot foresee at the present time any great extension in this aspect of seed production.

Seed Potatoes.—A further increase in the acreage entered for seed-potato certification is recorded, the area for the 1937–38 season being approximately 3,900 acres, an increase of 700 acres over the figure for the previous season. Just over 3,000 acres of this area have been accepted as certified subject to the tubers after digging and grading coming up to the standards set for certified seed.

The standards set at field inspection are continually being raised, and the time is now approaching when no further improvement in the general standard of crops under certification, particularly in regard to those of certain varieties, may be expected. In the Aucklander Short Top variety, for instance, the main variety under certification, the quality of the crops is such that any crop showing more than 4 per cent. of virus disease is rejected, while probably 70 per cent. of the crops of this variety inspected revealed a virus infection of less than 2 per cent. This position does not hold for all varieties, however, in some of which there is still scope for much improvement by means of selection and rogueing. The variety Inverness Favourite has come rapidly into favour, advancing from a single entry in the 1934–35 season until in the season under review the entries totalled fifty crops, with an acreage accepted which gives the variety fourth place in the list of varieties.

Wheat.—Wheat acreages show a decrease when compared with the acreages entered in the 1936–37 season, the figures for the respective seasons being 5,000 acres and 7,900 acres. Much of this reduction is no doubt due to the lower premium offered in the past two seasons for certified seed-wheat as against uncertified seed-wheat. Jumbuck is the only one of the five main varieties which has shown an increase in the acreage entered for certification, the other four varieties showing a reduction in acreage of from 25 per cent. to 50 per cent.

Small areas of the newer varieties—Tainui, Taiaroa, and Bencubbin—were included in the certification scheme for the first time.

Rape.—It is indeed unfortunate that the crops of Broad Leaf Essex rape-seed under certification in 1937–38 should again have failed, leaving only supplies of the Giant type of rape available for distribution. Satisfactory yields of this type were experienced, 306 cwt. of machine-dressed seed being obtained from 38 acres.

Seed Testing.

For the calendar year 1937 a total of 20,404 seed samples were received for testing and examination, this number representing an increase of 2,289 on the previous year's total, and is again a record.

The year's routine services required the undertaking of 32,068 tests, comprising purity analyses, 11,098; germination tests, 17,734; ultra-violet examinations, 1,537; picric-acid tests, 1,699.

As is usual, the bulk of the samples received represented commercial seed lines, and the results of the tests indicate that most of the seed on the market conformed to reasonable commercial standards.

To-day, more than ever before, the organized seed trade, both wholesale and retail, is operated almost completely on official test percentages, so that an objective which has been worked for for many years is almost attained. Through the co-operative efforts also of field extension officers the interest and attention of the farming community in matters relating to seed-quality has very noticeably increased, which fact, when associated with an enlightened and reputable seed trade, must be responsible for a general improvement in the standard of agricultural seed sown.

There is, however, still room for some improvement, particularly in respect of the small seed dealer and the purchaser of seed priced below ruling market rates for standard quality.

Investigational.

Low Germination in Perennial Rye-grass Seed.—Work on this problem has been continued during the past year, both in the laboratory and in the field. A progress report on the investigation has been prepared for publication.

Some phases of the study have been carried on in collaboration with officers of the Department of Scientific and Industrial Research; in particular, a cultural investigation of the disease by the Plant Diseases Division and the isolation of resistant strains by the Grasslands Division of the Plant Research Bureau.

A microscopic study of diseased seeds has been completed, from which much information has been gained respecting the structure and manner of growth of the causal organism and the nature of the injury to the seed.

Following the discovery by Mr. J. C. Neill of *Apothecia* on rye-grass seeds lying in the field over winter, a brief survey was made of pastures in the Manawatu, Hawke's Bay, and Southland districts. In each district the *Apothecia* were frequently encountered.

Experiments were carried out with a view to determining whether the *Apothecia* represent a phase in the life history of the rye-grass-seed parasite. The results of an inoculation experiment, in which a suspension of ascospores from *Apothecia* was applied to flowering rye-grass plants in the laboratory, gave support to this view. However, it has not been found possible, so far, to obtain in culture the *Pullularia* form from surface sterlized *Apothecia*. It is hoped that the position will be clarified by further study during the coming season.

From a practical point of view, the brightest phase of this work is still the examination of green sheaves from seed crops. Sixty-two examinations were made of crops during the period when the seed was developing and ripening, with a view to determining the proportion of diseased seeds. It is believed that when the technique is further developed such examinations may serve to distinguish crops which are seriously damaged and enable the grower to avoid the losses which are entailed in harvesting seed of low quality.

Seed-growers in the Manawatu, in particular, have availed themselves of this advisory service, and it has been found possible to forecast growth percentages fairly accurately to the evident satisfaction of the growers.

Malting Barley Studies.—In connection with the establishment of grading specifications of malting barley it was necessary to make a study of the incidence of flintiness in New-Zealand-grown barley. Eighty-six samples of grain were used. The examination of the surface of cut grains was found to be more satisfactory than the method of examining grains over a diaphanoscope. The results of this work provided a sound basis for the modification of the official grading standards with respect to the characteristics in question. Other work includes a study of the relationship between grain-weight and bushel-weight, and grain-weight with grain-size. The results obtained have proved of benefit in grading trials.

Peas: Germination in the Laboratory and in the Field.—The lack of agreement observed sometimes between the germinating-capacity determined by laboratory tests and the results obtained upon sowing in soil has recurrently been a source of trouble. A comprehensive investigation of the problem has been made at the Seed-testing Station. It has been found possible to suggest some improvements in the testing technique employed in the laboratory. The principal source of the trouble has, however, been found in susceptibility of peas, even those lots of the highest quality with regard to vitality, to inimical soil conditions. High soil-moisture content and the presence in the soil of parasitic organisms are the principal conditions which militate against the normal germination and development of peas in soil. It is now apparent that unless these factors are controlled agreement between laboratory and soil tests cannot be expected.

In the course of these investigations some attention was turned to the use of protective mercurial dusts. This work has not been brought to a conclusion, but it promises to yield useful results, and which should have a wide practical application.

Storage of Seeds.—In collaboration with Imperial Chemical Industries, experiments have been commenced with a view to ascertaining the influence of organic mercurial dusts upon the vitality of agricultural seeds under storage conditions. Several proprietary dusts are being used and about ten different kinds of seed.

The results so far obtained indicate that certain dusts have little or no deleterious effect upon the vitality of the seeds, and that others appear to be definitely toxic. This work is being extended during the present year.

Other Activities include.—(*a*) Studies of low temperatures for the germinating of newly harvested seeds, reduction of percentage of semi-hard seeds in subterranean clover, and presoaking of peas prior to germination.

(*b*) In collaboration with the Department of Scientific and Industrial Research, trials in the machine-drying of Chewings fescue, following the work carried out by the Seed-testing Station on the deterioration of seed during shipment from New Zealand.

(*c*) Special tests for the presence of black mustard in brassica seeds. The incidence of this impurity appears to be on the increase.

(*d*) Identification of various seed specimens submitted, and of impurities of commercial seed and stock foods.

(*e*) Determination of the percentage moisture content of various seeds intended for export.

(*f*) Soil tests on various commercial seeds as required.

(*g*) Preliminary work in the possible correlation of certain seedling characteristics and plant type. The continuance of this work will require glasshouse accommodation, the provision of which is at present under consideration. This work includes photoperiodism in red clover.

Government Seeds Purchasing.—For the year ending March, 1938, 668 requisitions for seed-supplies were placed on this office by various State Departments, which number represents an increase of nearly two hundred over that for the previous year. Owing to the scarcity of supplies, some of the larger purchases presented difficulty, but all requirements were satisfactorily filled, especially when full advantage was taken of rising markets in the early part of the season.

Land Utilization.

Principally because of constantly varying political, economic, and social factors, the world's agriculture has been in a state of flux for a considerable period. Largely because this state of flux continues it becomes particularly desirable for a country in which farming is a major industry to know accurately not only what is being done in its agriculture, but also what could be done under any specific set of circumstances with most benefit to the national welfare. In short, a full knowledge of all phases of land utilization becomes of paramount national importance.

This helps to explain why in recent years the increase in the amount of study devoted to land utilization has been one of the outstanding features of research relative to farming in several overseas countries including Great Britain and the United States of America. Similarly, the increasing attention which is now being given to investigation of land-utilization matters in New Zealand is in keeping with the fact that our farming position, far from being a stable one, is, and will be, dependent to a considerable extent upon trends in farming overseas. Our ability to adjust our farming most advantageously to changes in the world's agriculture will be strengthened by a full knowledge of the present and potential land-use within the Dominion.

The following matters relative to land utilization have been studied during the year:—

(1) A comprehensive land-utilization survey in Hawke's Bay.

(2) An examination of the position relative to the culture and the role of subterranean clover in Canterbury and the drier parts of Otago.

(3) A study of the farming and of the social and economic factors affecting the farming of Chatham Islands.

(4) A study of the economics of liquid-milk production in the region between Wellington and Palmerston North and adjacent to these urban centres.

(1) *Land-utilization Survey in Hawke's Bay.*—During the year under review the land-utilization survey in Hawke's Bay has been continued according to plan in that progress has been made approximately to the extent and along the lines that were expected. The survey embraces a study of the natural resources on which the farming of Hawke's Bay is based and a consideration of the economic and social conditions that bear upon land utilization.

The major endeavour of the Department of Agriculture consists of a survey of farm practice and farm management which is being carried out in close association with the soil-survey and pasture survey that are being undertaken by the Department of Scientific and Industrial Research.

In addition, considerable preliminary attention has been given to the public utilities and social services of Hawke's Bay that bear directly upon its farming. In this the co-operation of both the urban and the rural communities has been freely sought and generously given. As evidence of this, a well-attended repesentative meeting of delegates of public bodies held at Hastings on the 16th March decided (i) that the public bodies would provide data as requested for use in the survey, and (ii) that they would make a contribution of £400 towards the cost of publishing the report on the land-utilization survey. These decisions are tangible evidence of the viewpoint of the Hawke's Bay community in respect to the work.

The work is far from completed, but in due time a full and comprehensive report will be issued.

(2) *The Position regarding Subterranean Clover in Canterbury and the Drier Districts of Otago.*—Correlated with the greatly increased attention to and use of subterranean clover during recent years in the eastern part of the South Island there has been a considerable lack of exact knowledge based on field experience as to the culture and the role of subterranean clover in the farming of the region specified. Largely because of this lack of knowledge there has been much variation in the culture and utilization of subterranean clover in the region.

With the object of obtaining an indication of the relative worth of different practices, detailed information about the culture and utilization of subterranean clover was collected from 179 South Island farms during the latter part of 1937. The location of these farms was: 23 in Canterbury north of the Waimakariri River, 28 between the Waimakariri River and the Rakaia River, 42 between the Rakaia River and the Rangitata River, 40 in Canterbury south of the Rangitata River, 29 in North, 17 in Central Otago.

In rare instances the areas of subterranean clover which came under consideration were nine years to ten years old, but almost all were sown during the last three years, approximately 70 per cent. being in their first year, 17 per cent. in their second year, and 13 per cent. over two years old.

It is felt that dependable conclusions could not be based on the information obtainable during one visit to the areas being studied, particularly when such a large number of them are in their infancy, and hence it is planned to visit most, if not all, of the areas at least once again later on, it being expected that their behaviour in the interval will prove enlightening.

(3) *A Study of the Farming and of the Social and Economic Factors affecting Farming in Chatham Islands.*—A somewhat general study of the farming position in Chatham Islands was carried out. Among the main facts disclosed by this study are:—

(*a*) There is at present a trend of population away from Chatham Islands *e.g.*, in 1937 the passengers by sea from Chatham Islands exceeded by forty-five the inward passengers.

(*b*) In essential respects the climate approximates that of the North Island rain-forest districts. Hence, climatically, Chatham Islands is quite suitable for both sheep-farming and dairying.

(*c*) The economics of farming in Chatham Islands are basically affected by the remoteness of markets for farm produce and for farm stores and requisites.

(*d*) Having due regard to the farm economy of Chatham Islands as a whole, a compact block of 15,000 acres to 20,000 acres in the vicinity of Waitangi and Te One could advantageously be devoted to dairying at least to a considerable extent, and certainly to an extent sufficient to give the supply of butterfat needed by a butter-factory of an output large enough to allow of economical manufacturing costs.

(*e*) Sheep-farming, which is easily the most important phase of farming on Chatham Islands, shows a general upward trend in the numbers of breeding-ewes, lambs tailed, and total sheep.

In the five-year period, 1932–36 inclusive, the number of lambs tailed annually for every 100 breeding-ewes was 72·9: the corresponding figures were for the whole of New Zealand 88·8, and for the North Island 87·5 lambs tailed annually per 100 breeding-ewes.

(*f*) Chatham Islands offer considerable scope for advisory and investigational work designed to raise the standard of its farming to bring it into line with the plane of efficiency of the farming of New Zealand.

(4) *Survey of the Position regarding the Production of Liquid Milk.* Because the production of liquid milk for use in homes and schools is a matter of national importance about which the knowledge is incomplete in important respects, an investigation of the position has been undertaken in the territory between Wellington and Palmerston North and adjacent to these centres. The investigation is designed to cover thoroughly the economics of milk-production, and the objective is not only to give accurate information about the present cost of production, but also to indicate the major factors responsible for inter-farm variations in the cost of production and thereby possibly to point the way to betterment of the milk-producing industry. Specific matters which are being given attention relate to systems of feeding and provision of feed, herd-maintenance, pasture utilization and maintenance, distribution of calving-dates, types of soils, influence upon cost of size of herd, and of average annual herd-production of butterfat.

The greater part of the field-work necessary has already been carried out: it has involved obtaining data from approximately three hundred farmers, and in this it is gratifying to record that there has been extensive and useful collaboration of the farmers concerned with the officers carrying out the survey of the position.

Hill-country Sheep-farming. Probably the most momentous land-utilization problems of the Dominion are those that are associated with the efficient utilization of hill country devoted dominantly to sheep-farming. From time to time during the year as opportunity offered attention has been given to these problems with the ultimate object of drafting a programme of investigation designed to supply information about the economics of various types of farm practice and farm-management that are being or might be adopted on hill-country sheep-farms. It is considered that in this investigation close co-operation of the research workers with the farming and business interests, co-operation analogous to that obtaining in the Hawke's Bay farming survey, would be most valuable.

Young Farmers' Clubs.

Definite progress has been made during the past year. This is indicated by additional clubs and increased membership, and also by the type of work and the activities that have been successfully carried out by clubs, district committees, and the organization generally.

At the commencement of the period under review there were 122 clubs in the Dominion, with a total membership of approximately 3,000. Of the clubs, 60 were situated in the South Island and 62 in the North Island. To date there are *150 clubs* in the Dominion, comprising *67* in the South Island and *83* in the North Island. The total membership is now approximately *4,000*. The average membership per club is slightly below 27: the membership, of course, varies, a number of clubs having only from 12 to 20 members, while the greater majority have round about 30 members, and a few between 40 and 50.

With respect to future organization, it is not expected that many more clubs will be formed in the South Island. There is still a certain amount of scope in the western and eastern southland areas. Otago and Canterbury would appear to have almost reached saturation point, although it is possible that a few more clubs may be formed: the same applies to the Nelson and Marlborough districts. So far no start has been made in Westland, but it is possible, with the appointment of a fields officer at Greymouth, that one or two will be formed. In the North Island, Manawatu, Wairarapa, South Taranaki, Poverty Bay, Bay of Plenty, and Rotorua districts are well organized. Additional clubs have been formed in the Wanganui area, and before long the position there should be very satisfactory; it is anticipated that clubs will also be formed in the Hastings district. The position in the Te Kuiti district has steadily improved, and considering the disabilities in the North Auckland areas the work of organization is proceeding satisfactorily. New Clubs have been formed in the Waikato. The Auckland district appears to be stagnating, there being only one club in the whole area, while in North Taranaki organization is apparently at a standstill, there being only two clubs, which were formed nearly two years ago.

Club Work.—The type of work that has been undertaken and carried out in the clubs generally has shown a marked improvement during the year. While this is, in the main, more evident in the older clubs whose experience has taken them beyond the stage where their members are mere audiences at lectures, many of the younger clubs are competing with those longer established, and are in most cases holding their own. This is particularly noticeable in localities where strong district committees are functioning and assisting the clubs to carry out the aims and objects of the movement. The district committees form the key to the progress of the whole organization: they can act as the background to the work of the district secretaries among the clubs; they can help clubs by making suggestions for their programmes; and they can stimulate interest by arranging inter-club visits and district activities. New clubs formed in districts where a strong committee is functioning have the advantage of district organization and get into their stride far quicker than in districts where the committee is not very active or where no committee has been yet set up.

Agricultural and Educational Weeks.—Regarding district activities, the outstanding event has been the Agricultural Week held in Palmerston North last July, which was attended by approximately three hundred club members. This activity was carried out by the Manawatu District Committee, the local officers of the Fields Division being particularly prominent in the organization. The attendance was representative of forty-four clubs, all of them (with the exception of Kaitaia) being within the Wellington Fields Superintendent's area. Agricultural weeks were also successfully held in Nelson (at the Nelson College, with an attendance of about fifty members), and in Canterbury (at Lincoln College, the attendance being about seventy); both of these were organized and carried out by the local Fields Division officer, with the assistance of the district committee concerned. An Education Week for Young Farmers was also held in Dunedin during August, 150 Y.F.C. members

and others attending; this activity was organized by Mr. A. C. Cameron, of Dunedin, with the assistance of the local Y.F.C. district committee and Farmers' Union, &c. A successful Farm School was organized at Ruakura, Hamilton, by the Department of Agriculture, and attended by a number of Y.F.C. members.

Tours.—A successful tour, and one that pioneered activities of this nature, was undertaken last June by a party of fifty members of the Bay of Plenty clubs. Members travelled by motor-bus through the Waikato, Taranaki, Wanganui, and Manawatu districts to Wellington, returning via Wairarapa and Hawke's Bay, visiting farms and places of interest *en route*; the whole tour occupied eleven days. Other tours of a minor nature were carried out in the South Island shortly afterwards. Already this year (April) a party of Taranaki members journeyed through the South Island, proceeding as far south as Invercargill, and returning through Central Otago to Oamaru on the way home, the tour taking a fortnight. A party of twenty-four Central Otago members carried out a week's tour, visiting farms, &c., in South Canterbury. Other tours are being arranged for the immediate future.

Tour of Australia by New Zealand Y.F.C. Members, and Visit of United Kingdom Young Farmers to New Zealand.—The Dominion Championship Stock-judging Competitions for members of Young Farmers' Clubs were held at the Royal Show, Palmerston North. By means of entry fees, &c., a sufficient sum was raised through the clubs to provide the nucleus of a fund to send a team of five members to Australia (at the invitation of the Australian Junior Farmers' Clubs organizations). The balance of the amount required was made up from the Government grant for 1937–38. The winners of the four stock-judging classes were selected, and as they were all members of North Island clubs, the South Island members of the Dominion Executive were allowed the choice of a South Island Young Farmer as the fifth member of the team. The five members of the team left in February and were absent for about ten weeks. During that time they toured South Australia and New South Wales as the guests of the Australian organizations, finishing up at the Sydney Royal Show. On their return they brought back with them the four United Kingdom Y.F.C. members who had accompanied them. These lads were entertained in the Dominion for three weeks, visiting the South Island, journeying as far as Oamaru, and travelling in the North Island through Wairarapa, Manawatu, Taranaki, Waikato, Rotorua, leaving finally from Auckland on their return journey to England, via Sydney. While they were in New Zealand they were the guests of the New Zealand Federation and club members, &c., in the districts that they visited. Both the tour of Australia by the New Zealand team and the visit of the United Kingdom members has done much to arouse interest in the movement.

Y.F.C. Constitution.—During the year some radical alterations have been made to the constitution of the New Zealand Federation of Young Farmers' Clubs. The effect of these alterations has been to give a better proportionate representation by active club members on the various committees, &c.; in addition the two Island Councils as set up at the time of the reorganization have been abolished and four Provincial Councils, two in each Island, established in their place. The Dominion Executive will be made up of delegates from these Councils.

"*Journal of Agriculture*" *as the Official Organ of the Y.F.C.*—Commencing in January last the *New Zealand Journal of Agriculture* became the official organ of the New Zealand Federation of Young Farmers' Clubs. The federation accepted an offer by the Department of space in the *Journal* for Y.F.C. notes, &c., with a special concession rate of 1s. per annum subscription to club members, the *Journal* to be post-free through club secretaries. The space provided has been of great value and service to the organization, and as well as editorials and club notes, contributions by members have been published.

General.—The assistance of Mr. W. F. McLaren, Dominion President of the Federation, has been of great value to the organization during the past year. He toured the South Island, meeting the members of district committees, and has also travelled through the Hawke's Bay and Poverty Bay areas, and carried out a tour of North Auckland. On these occasions he gave valuable stimulus to organizations throughout the various districts.

Irrigation.

There are a number of irrigation schemes in operation and others being brought into being, particularly in Central Otago and Canterbury. With respect to all these schemes my Division has closely co-operated with the Public Works Department, and good headway has been made. With the greatly-increased area being brought under irrigation it was considered advisable, in order that the demand for advice on irrigation matters might be satisfactorily coped with, to augment the instructional staff. To this end three Instructors have been appointed and have been located on irrigation areas in Canterbury. I feel sure that with the undoubted development in the near future of irrigation farming the arrangements made will enable the Division to direct such farming along proper lines to the ultimate benefit of the settlers and the country generally.

Farmers' Field Competitions.

Competitions in a variety of farm crops and with pastures have been held in numerous districts for many years past. These competitions have been an excellent means of disseminating information and instruction to farmers by field officers. Unfortunately, in some districts the number of competitions show a falling off, although not to a serious extent. There is no question that the competitions in the past have improved farming methods, particularly in those districts where they have been held, and I am satisfied they could be developed in all districts with distinct advantage. This is a matter which will receive further attention immediately, more especially as regards competitions aimed at pasture improvement.

Artificial Fertilizers.

It is pleasing to record an appreciable increase in the deliveries of both artificial fertilizers and lime to farmers. In actual fact deliveries for both commodities have for the year under review reached quantities considerably in excess of any previous year. The quantity of artificial fertilizers delivered at officered railway-stations was 987,180 tons and of lime 378,902 tons. The corresponding figures for the previous year were 743,829 tons and 293,540 tons respectively.

The Division's officers have consistently advocated the top-dressing of pastures and the use of fertilizers with all cereal and root crops, and the increased deliveries, indicating as they do the more general adoption of the advice tendered, is most pleasing and cannot but help being reflected to the advantage of both the farmers and the country as a whole.

Registration of Fertilizers.

Registration.—Registrations were carried out satisfactorily, although such work was unduly delayed owing to a tendency on the part of vendors to delay registration, and consequently three to four months elapsed before registration was completed.

Inspection and Visits.—Visits were paid to fertilizer-works and also to merchants' stores in Auckland, Wellington, Christchurch, and Dunedin. Official samples were taken for analysis and invoice certificates inspected.

Fertilizer Statistics.—From time to time quite a number of inquiries were received regarding imports and production of fertilizers, and these were duly attended to.

Show Displays.—A display of fertilizers was arranged for exhibition at the different agricultural and pastoral shows.

Revision of the Fertilizer Act.—Much preliminary work has been done in regard to this matter, and a report dealing with the proposals is being drawn up for consideration. The report will deal with:—

(1) Standardization of nomenclature of phosphatic fertilizer.
(2) Standardization of organic by-product fertilizer.
(3) Review of the lime questions and proposals, whereby lime could be brought under the Act.
(4) The present system of sampling and suggested improvement.
(5) Necessary amendments to the present Act and general recommendations.

If the Act is to prove effective, then the report should be considered and an amended and fuller Act be cast.

Exhibits at Shows.

During the year a policy was adopted of staging a departmental exhibit at those agricultural and pastoral shows and the like which asked for such an exhibit and where the request could reasonably be met. In each instance the exhibit was made as instructive as possible of the various phases of the Department's work, and in all cases, judging by the appreciative letters received and oral messages passed to officers responsible, there is no question the action of the Department met with universal approval.

The Phormium Industry.

No improvement was shown during the year under review in this industry, and actually the amount of fibre produced is very little in excess of the production for the previous year. The output of hemp for 1937–38 was 40,592 bales, an increase of 800 over the figures for the previous year. With respect to tow, the output of 12,984 bales showed an increase of 252 bales over the corresponding figures for 1936–37.

At the commencement of the current year there was a sharp decline in prices for hemp fibre, and as a result the majority of the mills in the Auckland and Wellington provinces closed down, and at time of writing are still idle.

Departmental Photography.

During the year the photographer's accommodation was enlarged and renovated and more modern equipment installed. This has enabled the photographic section of the Division to supply a really excellent service not only to all sections of the Department requiring photographic services, but also to research institutions such as the Plant Research Bureau, the Dairy Research Institute, Massey Agricultural College, and others. I should like to repeat that the class of work put out by the photographer is of a very high standard.

Staff.

The work and functions of the Fields Division are many and varied in character and are continually expanding. They call for resource, initiative, and energy, but the whole staff has co-operated in a manner which could not be improved, and I desire to record my appreciation of this loyal and whole-hearted support.

DAIRY DIVISION.

REPORT OF W. M. SINGLETON, DIRECTOR.

The Season.

The year under review will be long remembered by suppliers in some of the prominent dairy districts as one of extremes. The autumn and spring of 1937 were generally favourable to dairy cattle and production, whereas the remainder of the financial year gave cause for varying degrees of disappointment to dairy producers depending on local climatic conditions. North Auckland, Taranaki, Hawke's Bay, Canterbury, and Westland have been more fortunate than the other dairying districts as grass was generally sufficient, and in some districts was for a time somewhat overgrown and less palatable than that most suitable for maximum production.

There has, however, been a falling off in production for the Dominion, and this has been caused by a number of contributing factors. The lack of rainfall in such important districts as South Auckland, Wellington, Otago, and Southland was the major factor. The prolonged summer period of dry weather with temperatures much above normal, and the resultant decrease in milk-production, will not soon be forgotten by dairy suppliers in these districts.

There has been some diversion from dairying to the grazing of sheep. A number of persons who were dairying during the preceding season sold their herds and devoted their grazing to sheep entirely, while probably a larger number reduced their milking-herds and purchased some sheep to take their place. It is reported that difficulties in getting suitable labour for dairy-farming have been a potent factor operating in the direction of influencing a reduction in the number of cows milked.

Production.

Returns for the twelve months ending 31st March, 1938, show that 145,596 tons creamery butter and 86,012 tons cheese were received for grading, as compared with 151,436 tons butter and 89,966 tons cheese for the previous year, a decrease of 5,840 tons butter (3·86 per cent.) and 3,954 tons cheese (4·40 per cent.). In terms of butterfat the decrease represents 6,388 tons, equal to 3·97 per cent.

Export Values.

Basing export values on Customs figures, and including all dairy produce—butter, cheese, casein, dried milk, sugar of milk, and condensed milk and cream—there was an increase of £2,452,994, the total values for the two financial years 1937-38 and 1936-37 being £24,237,922 and £21,784,928 respectively. The value of the by-products increased slightly, by about £35,000. In view of the decrease in quantities of butter and cheese exported, however, it is obvious that the substantial increase in total value could only be due to better prices at the marketing end. Customs values are based on estimated realization values.

Zoning.

Reports of the Executive Commission of Agriculture indicate that fifteen proprietary dairy companies have been bought out by co-operative companies and that fourteen co-operative companies have amalgamated with or sold out to neighbouring co-operative companies. With the exception of the Coromandel Peninsula, the Commission has visited every dairying district in the Dominion and has issued 106 orders under the Dairy Factory Supply Regulations, 1936, defining cream collection areas and routes.

This does not mean, however, that the work of zoning is nearing completion. Much remains to be done. Certain factories have not yet been dealt with, while a number of the arrangements are more or less temporary and will need to be reveiwed at a later date.

Officers of the Dairy Division have been able to render useful advice and assistance to the Commission in a number of instances.

Creamery Butter.

Taken as a whole, the average quality of creamery butter showed a slight improvement, the average grade for the year being 93·371 points in comparison with 93·266 points for year ending 31st March, 1937. Of the 145,596 tons of butter received for grading, 120,950 tons, or 83·07 per cent., was classed as finest, 23,878 tons, or 16·40 per cent., as first, and 768 tons, or 0·52 per cent., as under first grade. Butter received for grading at the Auckland port during the year totalled 104,307 tons, indicating that the bulk of our butter is produced in the Auckland Province. The practice of disposing of butter of lower than first-grade quality through a channel which does not allow it to come into competition with the higher grades has been continued.

Several factors have operated in favour of improved butter-quality, most of which have emanated from recently introduced legislation pertaining to the administration of the industry. The premiums given under the Government's guaranteed prices scheme have encouraged suppliers to deliver a higher-quality cream, a better-class raw material enabling the manufacture of a higher-quality finished product. The zoning of factory supply and the consequent removal of the possibility of loss of supply through dairy-farmers transferring from one factory to another has given factory-managers courage to adhere to a standard of cream-grading more representative of the true quality of the product. Zoning has also, in a number of cases, brought about the delivery of supply to a nearer creamery, the

raw material thus reaching the factory in better condition. In addition, the trend toward daily delivery of cream in a number of districts where alternate day delivery was formerly the practice has been an important factor.

The principal problems confronting buttermakers may be linked up with climate and pastures. During the recent hot, dry summer manufacturing conditions were at times most unfavourable, and butter coming forward for grading during that period bore evidence of the general quality of the raw cream. With the advent of spring growth feed-taint in several Waikato brands caused concern on account of the loss in grade, and in some instances dairy companies could not reconcile this characteristic in the butter with the dry weather experienced. The fact remains, however, that an abnormal growth of clover was prevalent in the Waikato, proof of which was supplied by the Waikato apiarists, who reported a phenomenal season for honey-production.

Reports from the Home market indicate that a percentage of our salted butter contains ample salt for the taste of British consumers, and it has been suggested that our regulations could with advantage be amended to provide for less salt in the finished product.

Most of the unsalted butter manufactured during the past season was certainly very attractive in flavour. At the same time it is questionable whether some dairy companies have not attempted to make too much unsalted. Experience has proved that severe culling of cream is necessary to ensure good-keeping quality in unsalted butter. For the year ending 31st March, 1938, 4·91 per cent. of the total butter graded was unsalted, as compared with 4·77 per cent. for the previous financial year.

pH Testing of Butter.

What is known as the pH test of butter is a test for alkalinity and serves the purpose of indicating the excessive use of neutralizer. During the past year 3,191 samples of butter were tested for pH content at the Auckland grade stores, 289 at New Plymouth, 185 at Castlecliff, and 3,582 at Wellington, a total of 7,547, in comparison with 5,202 for the previous year.

The institution of this work has been well worth while, and has been proved to have beneficial results. The records obtained have enabled Dairy Instructors to keep in touch with creameries requiring attention, and for some time past there have been fewer complaints from overseas with reference to soda flavour in New Zealand butters.

The bacteriological examination of butter was undertaken at Auckland early in the present season, whereas during the previous season some samples were forwarded to Wallaceville for examination. Bacteriological tests carried out at Auckland numbered 816. The Dairy Instructors of the district were furnished with returns giving particulars of the various counts, and the information supplied has enabled these officers to convince managers that in some instances more attention to creamery plant is desirable. There have been several instances where a definite reduction in the counts has been noted after the Instructor's visit to the creamery, and this should ensure sounder keeping-quality of the butter manufactured.

Testing Butter for Moisture and Salt Content.

Moisture tests carried out at grading ports during the year covered 165,096 churnings, of which 0·30 per cent. indicated butter with a moisture content in excess of the legal limit. The maximum moisture content of exported butter permitted under the Dairy Industry Act is 16 per cent., while this is also the legal requirement in respect of butter imported into Britain. Butter found to contravene the law is returned for reconditioning to the dairy company concerned.

Salt content of butter is provided for in the Dairy-produce Regulations, which permit maximum and minimum percentage limits. Salt tests carried out during the year totalled 151,595, of which 0·18 per cent. were outside the legal limits, and, at the direction of the Dairy-produce Grader, were withdrawn from shipment. By permission, however, a number of shipments of butter with a salt content outside the legal range, were made to special markets.

Butter-boxes.

The question of continuing the use of the Saranac box has been under consideration, and it is recognized that there have been many reports from the London end with regard to dust gaining access to the butter and causing contamination. In a number of instances it was necessary to remove the block of butter from the box for scraping, thereby causing monetary loss and inconvenience to traders, goodwill suffering to some extent. The consensus of opinion of officers of the Dairy Division and the Marketing Department in London is to the effect that we should standardize on one type of container, and experience has indicated that what has been known as the sub-standard box is probably the most suitable for the purpose. The matter has been discussed with many of those prominent in the industry, including the New Zealand Dairy Board, and it appears probable that the regulations will be so amended at a later date as to give effect to the suggestion that the sub-standard will be the only export butter-box permitted, and will in future be known as the standard box.

Whey Butter.

There was a substantial increase in whey-butter production, gradings for the year ended 31st March, 1938, totalling 1,820 tons, as compared with 1,484 tons for the previous year, an increase of 336 tons. Quality was about the same as in previous years, more care in manufacture being necessary before the finished product can be expected to reach the desired standard. Similar to second-graded creamery butter, whey butter is sold through channels which do not bring it into competition with the higher-grade article, and is used exclusively for processing and cooking.

Cheese.

Cheese sent forward for grading totalled 86,012 tons, of which 9,327 tons, or 10·84 per cent., were graded as finest, 72,775 tons, or 84·61 per cent., as first, and 3,910 tons, or 4·54 per cent., as under first grade. The average grade for all cheese graded was 91·934 points, as compared with 92·140 points for year ended 31st March, 1937.

While average points receded very little, there was considerably less cheese in the finest class and more in the second-grade than in a normal season. Several factors influenced the position. The season was a particularly trying one from a cheesemaker's point of view, very warm and humid conditions being experienced in all dairying districts from early December until the end of March. The deterioration in the quality of the milk-supply over this period was very noticeable, a large percentage of second-grade milk being received at many factories, but particularly at those situated in the Auckland Province.

The lack of reasonably cold water for cooling purposes was largely responsible for the lower-quality milk-supply. This matter presents a serious problem, especially in the Auckland District during a season such as the past. Suggestions have been made regarding the installation of small cooling-plants on dairy-farms. This would certainly provide a solution, but it is doubtful whether the dairy-farmers of New Zealand are as yet prepared to entertain such a suggestion.

Openness in texture was the most common fault in the cheese, and even at factories where otherwise good-quality cheese was being made difficulty was experienced with openness. Since the early spring, however, very little starter trouble has been experienced, and the general opinion of factory-managers would probably be that during the past season they had fewer starter failures than for some time past. Reference should be made to a new type of imported culture introduced during the season. This was discarded after a brief period of trial in the Wairarapa and Taranaki, but was responsible for raising the percentage of second-grade cheese turned out in these districts during the past season.

The long spell of exceptionally warm weather again emphasized the need for control of temperatures in cheese-curing rooms. It would probably be safe to state that for four months of the season curing-room temperatures were seldom under 70° F., and in many instances temperatures much higher than this were registered. These high temperatures have a very detrimental effect on the quality of the cheese, and may possibly be partly responsible for the openness in texture found in many cheese. Much useful work has been done in the direction of persuading dairy companies to have curing-rooms insulated, but the benefits of insulation were to a great extent lost owing to the fact that for a considerable portion of the past summer there was very little difference between night and day temperatures. It would appear that insulation, however desirable, can only be regarded as a preliminary step to temperature control, and this in turn can only be obtained by the installation of artificial refrigeration linked up with a sound system of insulation.

During the season a Dominion award for dairy-factory workers came into operation. This award provides for a fifty-two-hour week for five months, a forty-four-hour week for four months, and a thirty-eight-hour week for three months of each season in cheese-factories. No trouble was experienced during the fifty-two-hour period, but when the hours of work were reduced to forty-four it was found that some dairy companies were endeavouring to work a forty-four-hour week divided into six days. This provides for a working-day of only 7 hours 20 minutes, which time is inadequate for the production of good cheese. The employees in the majority of the cheese-factories, however, worked a five-day week during the forty-four-hour period, and this would appear to be a satisfactory solution. It has been noticeable that during the latter portion of the present season several lines of cheese coming forward for grading showed evidence of careless finish. At most ports quite a number of crates of cheese were rejected on this account. This defect can be largely attributed to hurried methods of manufacture.

Finally, attention is drawn to the marked falling off in the quantity of cheese made, and the definite trend of favour toward butter-manufacture.

Casein.

There was a decided drop in the output of casein, due probably to the abnormal conditions in Japan, our largest buyer, through war with China.

Casein graded during the year totalled 983 tons, as compared with 1,326 tons for 1936–37, a decrease of 343 tons. Grading, however, is not compulsory, and Wanganui is the only centre where the service is continuous. Gradings therefore do not represent the true position in respect of total exports, and Customs returns indicate that exports for the year amounted to 3,203 tons, valued for Customs purposes at £215,133, as compared with 4,185 tons, valued at £218,433, for the previous year.

Regrading of Butter and Cheese.

The practice of selecting representative samples of butter and cheese for re-examination after a period of storage—usually two to three months—has been continued at Auckland and New Plymouth. Regradings at Auckland covered 280 boxes of butter and 100 crates of cheese, and at New Plymouth 24 boxes of butter and 30 crates of cheese. The factory-managers are invited to be present when the regrading is in progress, and there has usually been a good attendance of managers, while the meetings have proved very useful from various angles.

The information gained from the re-examination of butter and cheese after a lengthy period in store has been of distinct value from the point of view of judging keeping-quality. A pleasing feature is that taken as a whole, our grading standards have been confirmed.

Cool-store Temperatures.

The period for which butter and cheese must be held in cool store prior to shipment is prescribed by regulation, while the temperature at which such produce must be held is also laid down in the Dairy-produce Regulations. During the past year officers of the Division have continued the practice, commenced in 1936, of taking records of the daily readings at all ports. A survey of these records indicates a decided improvement, and while there have been odd periods of irregularity it can now be stated that the general position with regard to holding temperatures is satisfactory. The matter is of great importance from the point of view of its influence on the ultimate quality of the product.

Grading of Milk and Cream.

As stated elsewhere, the zoning of supply has had a favourable influence on the grading of milk and cream at dairy factories, the opportunity for transfer of supply owing to dissatisfaction with the grading having been removed. Officers of the Division have continued to exercise a strict supervision over the work, and inspections have shown that, taken as a whole, the grading is being satisfactorily carried out. Each year, however, brings a number of cases where the grading standards adopted by certain factory-managers are in need of adjustment, and the necessity for supervision is amply demonstrated. The regulations appear to be working smoothly, and the methods laid down accepted as part of the dairy-factory routine.

Milk and cream grading, combined with farm dairy instruction, and the more general practice of daily delivery of cream to creameries, have had an obviously favourable effect on the quality of our produce.

Check-testing Suppliers' Milk and Cream Samples at Dairy Factories.

Recognizing that the testing for butterfat of milk and cream supplied to dairy factories calls for extreme accuracy and warrants careful supervision, officers of the Dairy Division devoted considerable time to checking up the work of factory-managers in this connection. For the year ended 31st March, 1938, divisional officers carried out 1,303 check tests, as compared with 858 for the previous year. In a number of cases factory-managers were advised that more careful work was expected, though, taken as a whole, investigation indicated that most factory-managers were performing this duty in a manner which left no grounds for adverse criticism.

Farm Dairy Instruction.

Three additional Farm Dairy Instructors were appointed during the year under review, the total now being forty-two, these officers being employed by eighty-six dairy companies, whose suppliers number 35,030 of a Dominion total of 69,698.

The value of farm dairy instruction is particularly apparent in climatically unfavourable seasons, and the Division's officers have reported that during the past season the produce of dairy companies enjoying the services of a Farm Dairy Instructor did not decline in quality to the same extent as that of less-fortunately-placed creameries.

The question of placing the Farm Dairy Instruction service on a Dominion-wide basis has been the subject of considerable discussion by the Government, and it is expected that during the coming season all dairy factories in New Zealand will be brought within the scope of the scheme. Should this eventuate it will have to be regarded as one of the most important reforms in the history of our dairy industry.

Inspection of Milking-machines.

According to notifications received in the Division's Head Office 3,006 milking-machines were installed during the past financial year, as compared with 3,195 during the previous twelve-months. The majority of the installations are inspected by Farm Dairy Instructors, who report a commendable effort on the part of erecting firms to comply with the regulations. Very few contraventions are met with.

Dairy-factory Managers' Registration Board.

The Board held three meetings during the year, two in Wellington and one at Palmerston North. Applications dealt with totalled 691, 631 of these being for renewals of certificates previously issued and sixty were new applications. Of the former all were renewed, and of the latter forty-two were granted certificates. Fourteen were requested to sit for examination, three were deferred for further information, and one was declined. In addition, twelve names were removed from the Register of Dairy Factory Managers owing to the holders of the appropriate certificates of registration having given up dairy-factory work.

During the year Mr. P. C. H. Petersen, who had been Chairman of the Board since its inception, resigned, as he was leaving for an extended trip abroad. Mr. J. McK. McDonald, Manager, Cheltenham Dairy Co., Ltd., was appointed to fill the vacancy, and is the present Chairman.

It is pleasing to record that dairy companies, as well as all holders of appropriate certificates as managers, appear to have a fairly good knowledge of the Dairy-factory Managers Regulations, and that it has not been necessary to institute proceedings against any company or certificated person for any contravention of these regulations.

Inspection of New Zealand Dairy-produce in Britain.

The work and responsibilities of the Division's officers in London appear to be increasing annually. Mr. F. H. Taylor and his two assistants, Messrs. G. V. Were and H. A. Foy, report another extremely busy year. The present system of marketing brings them into close co-operation with the

London Branch of the Primary Products Marketing Department, and much of their time is devoted to special inspections and the consideration of claims of purchasers in reference to alleged faulty produce. In this respect one pleasing feature is a decrease in the number of complaints relating to foreign matter in New Zealand butter and cheese. While, however, the position has improved, there is still cause for concern, and supervision has been tightened in an endeavour to bring about greater safeguards in the dairy factories of this Dominion.

In addition to his regular duties, Mr. Taylor is frequently called upon to act in a special capacity on various committees and at various conferences relating to dairy industry matters. He was, for instance, an official representative of New Zealand at the Eleventh World's Dairy Congress held in Berlin in August of last year. Mr. Taylor filled this responsible post with distinction and, apart from the personal contacts which he made while in Germany and the educational benefit of his experiences, his report to the New Zealand Government is a valuable document for present and future reference. Mr. Taylor is also a member of the British Standards Institute, and his work on the committee of this organization has taken him to the Continent of Europe on at least one occasion during the year.

The London inspection service constitutes the final link in the chain of Government supervision of New Zealand's great dairy industry, and renders invaluable service in the direction of enabling a reliable guide to the consumer's tastes and requirements.

Dairy Laboratory, Wallaceville.

It is the aim of the Dairy Division's Laboratory at Wallaceville to provide to the instructional and grading staff a service for the carrying-out of routine tests upon samples of dairy-produce in order to assist the industry throughout the Dominion. During the past year the number of samples dealt with has again increased considerably, and a total of nearly three thousand have been dealt with. This represents an increase not far short of 50 per cent., and, in addition, several hundred milk and cream samples were submitted to various tests in dairy factories. Of the total, nearly two thousand consisted of butter samples for bacteriological tests.

For some six years past the Laboratory has endeavoured, especially by the testing of starters for bacterial contamination, to improve the conditions under which starters for cheesemaking are kept in dairy factories. During the past season nearly four hundred starter samples were tested for bacterial contamination, this number being a little short of double the number dealt with the previous season. A fair proportion of these starters had originally been supplied from this Laboratory by request of the factories. The results of these tests indicate that progress is being made in the handling of starters under factory conditions. The number of contaminated samples, however, indicates the need for increased efforts to improve the position. Besides starters for cheesemaking, butter-starters continue to receive a small amount of attention.

The Laboratory has endeavoured to keep in touch with the latest developments connected with milk-grading. For this purpose a small number of trials have been carried out with a new dye, resazurin, which is said to possess certain advantages over methylene blue. For the purpose of cream-grading resazurin has given very promising results indeed, and the test has been found to correlate satisfactorily with cream-grading by the ordinary method. Much more work requires to be done to ascertain the possibilities of the test, but present indications are that it is more promising than any other bacterial test which has been tried for the purpose.

As in the previous season, bacteriological tests upon butter from the grading-stores have constituted a major portion of the work of the Laboratory. Early in the season arrangements were made for Auckland butters to be tested in the grading-store at Auckland, and in their place samples have been procured regularly from New Plymouth by means of an ice-box to check changes during transit. In reporting the results of these tests a higher standard has been set than in previous seasons. While some factories seem to have no difficulty in regularly making butter with a minimum of bacterial contamination others fail to reach the desired standard. Reports have been received which indicate that where unduly large numbers of bacteria have been found some part of the plant has been discovered to be in an unsanitary condition. These tests are of particular value in enabling such defects to be discovered usually before the trouble has become acute enough to affect the grading of the butter. In following up these tests in some factories by more detailed tests for the source of contamination it has been possible to find the parts of the plant which are particularly responsible for the trouble. This work has indicated the desirability of devising improved methods for the cleaning of the large refrigerated cream-vats.

As in past seasons, the Laboratory has endeavoured to assist in the procuring of improved factory water-supplies, attention being given principally to the waters used for butter-washing purposes. The Instructors have assisted in making a survey of the water-supplies of butter-factories throughout the Dominion, and the information so collected has enabled first attention to be given to those cases where the water-supply may be of doubtful quality. The number of water samples dealt with is appreciably greater than those tested in the previous season, but many more factories still remain to receive attention. In addition to bacteriological tests, chemical tests are also carried out so as to enable advice to be given about the treatment of the water.

The principal chemical work carried on in the Laboratory has been the testing of butter for metallic contamination. The improved methods devised for the purpose have been applied during the past year, especially to the testing of samples for copper content. In districts where a considerable amount of stainless-steel equipment has been introduced during recent years the copper content is usually satisfactorily low. In other districts, however, a number of factories are still making butter with a copper content which is likely to adversely affect its keeping-quality. Whey butter often has too much copper. In many cases this might be reduced to a more reasonable figure if the plant were kept in better condition.

During the winter the opportunity was taken to arrange for the Division's Cheese Instructors to spend a few days at the Laboratory. These visits were primarily for the purpose of giving some tuition in the refinements of bacteriological technique with a view to achieving more satisfactory handling of starters under factory conditions. Apart from the practical bacteriological work done by the Instructors themselves on that occasion, a number of useful discussions took place upon various phases of the Laboratory work and its relation to factory work.

As already mentioned, the bacteriological testing of Auckland butters has been carried out during the past year in the grading-store at Auckland. Apart from the relief to the work done at Wallaceville, this arrangement has the advantage of enabling the Grader, and also factory-managers who may visit the grading-stores, to see the actual procedure adopted to ascertain the bacterial content of the butter. As in the previous season, pH colour tests of butters have been carried out in the principal grading-stores, and at Auckland these tests have continued to be checked electrically. In contrast to the position obtaining before this work was undertaken, very few of the butters now manufactured are either too acid or too alkaline. In particular the use of excessive amounts of soda for neutralizing cream is now comparatively rare. The skilled assistance available at Auckland has also enabled various other useful pieces of Laboratory work to be undertaken when necessary.

Legislation.

No legislation with a direct bearing on the Division's work was enacted during the year. The consolidation of the Dairy-produce regulations is now almost completed, and it is expected that the regulations in their new form will be ready by the opening of the new dairying year.

Mention should perhaps be made of an important amendment to the Primary Products Marketing Act, 1936. The amendment in effect divided the Marketing Department into two branches external and internal marketing, and bestowed considerable powers in respect of the Government control of dairy-produce intended for local consumption.

Prosecutions.

Legal action in respect of breaches of the Dairy Industry Act was taken in two cases during the year. One concerned neglect to cover cream-vats, and the other failure to make differential payments according to grade in respect of milk received for cheesemaking. In both cases the Magistrate's decision was in favour of the Department, and fines were imposed. The moral effect of the publicity emanating from such prosecutions is an important influence in causing dairy companies and dairy-factory managers to adhere to the regulations.

Certificate-of-record Testing.

Entries for certificate-of-record test seem to have reached a more or less stable position, and the number of certificated cows varies little from year to year.

During the calendar year 1937 first-class certificates of record were issued for 554 cows, as compared with 534 cows in 1936, 494 cows being in the yearly test division and the remaining 60 in the 305-day division.

An increase in average production is recorded for first-class records in the yearly division, the 1937 figure 512·68 lb. butterfat representing an increase of 3·68 lb. over the average of 509 lb. for the year 1936. A considerable increase in average production was also shown in the 305-day test division. The average production for the sixty first-class certificates issued in this division was 452·90 lb. butterfat, compared with 437·94 lb. for forty-four certificates issued during 1936, an increase of 14·96 lb.

Government Official Herd-testing.

This adjunct to the certificate-of-record system received increased support during the tenth year's operations, and the summary for the year ended 30th September, 1937, shows that 2,102 cows were tested, an increase of 192 over the previous season's total of 1,910. This season 207 breeders tested cows, as compared with 183 in the previous season. The average yield for the 1,904 cows milked 180 days or more was 332·76 lb. butterfat from 6,971·7 lb. milk.

It is interesting to place on record the fact that since the commencement of the system 18,794 statements of seasonal production have been issued for 12,953 cows, 5,841 of which have been tested more than once.

Ordinary Herd-testing.

Although this work is now under the supervision of the Herd Recording Department of the New Zealand Dairy Board, the Dairy Division still carries out the "association own-sample" testing for a few associations, numbering about four hundred cows in all.

Staff.

Four officers were added to the staff during the year, while one officer, Mr. A. Y. Cowie, resigned owing to ill health.

Messrs. J. Kerruish, J. Mitchell, and G. Campbell were appointed as Farm Dairy Instructors, and Mr. K. Henshilwood as Testing Officer in place of Mr. Cowie.

Thanks.

Appreciation is once more extended to the staff of the Division for assistance rendered during the year. It is also desired to place on record the courtesy and co-operation of those organizations whose functions bring them in contact with the work of the Division.

DIVISION OF HORTICULTURE.

REPORT OF J. A. CAMPBELL, DIRECTOR.

The Fruitgrowing Industry.

The weather conditions experienced during the 1937–38 fruit season were, generally speaking, favourable to the satisfactory carrying-out of orchard operations. In the bulk of the commercial fruitgrowing areas the crop of apples and pears was above the average, some districts yielding heavy crops. A severe frost caused heavy losses in apple orchards in a portion of the Otago Central district, and damage to a lesser extent occurred from the same cause in the Marlborough district.

The yield of stone-fruit promised to be a good one, but, unfortunately, the warm moist conditions at the time of ripening favoured the development of brown-rot, which considerably reduced the crop, chiefly peaches, in some localities.

The crop of berry fruits—raspberries, strawberries, &c.—was a satisfactory one.

Ordinary orchard diseases and pests were readily kept in check, although in some districts, owing to the favourable weather conditions, red mite, codling-moth and leaf-roller caterpillar were more than usually in evidence and caused a good deal of concern to the fruitgrower.

With the exception of an outbreak in the Motueka district, fireblight was not conspicuous during the year. Arrangements are being made for that portion of the Waimea Commercial Fruitgrowing District to be brought under the Second Schedule of the Fireblight Regulations 1937.

With the increased cost of fruit-production there is an indication that growers are gradually concentrating on the working of smaller areas, with the result that orchard operations are being carried out more thoroughly. The absolute necessity of producing only good fruit is realized by the majority of growers, and considerable efforts have been made during the year to attain that end. Increased attention is being paid to every phase of the industry, pruning and spraying have been more thorough, better methods of cultivation have been employed, the application of manure has received added attention, and budding and grafting to eliminate non-paying varieties have been increased. A further sign of progress has been the number of stationary spraying-plants installed and the acquisition of the latest type of fruit-grading machines.

The Government has decided to extend the subsidy to apply to fruit sold during the 1937–38 fruit season, growers to submit account sales monthly, and all commercial orchardists have been duly notified. The subsidy applies in cases where the average market return for fruit is below the assessed fair return. The amount paid to growers under the scheme in respect to last year's sales amounted to approximately £10,000.

The growing of citrus fruits continues to attract considerable attention. The total area now under cultivation is approximately 2,000 acres (lemons 1,400 acres, oranges 600 acres), the bulk of which is in the Auckland, North Auckland, and Tauranga districts. The estimated production for the past season from commercial orchards was 140,000 cases lemons, 15,000 cases sweet oranges, and 30,000 cases New Zealand grapefruit. A further improvement is noticeable in the grading and packing of lemons placed on the local markets.

A good demand exists for New Zealand grapefruit (Poorman orange), Morrison's seedless strain, which is held in high regard as a breakfast fruit.

The co-operative citrus curing and packing shed at Kerikeri commenced operations in May last, and the matter of establishing similar premises in the Gisborne district is at present receiving the attention of growers in that locality.

An outbreak of citrus canker occurred in the citrus orchards at Kerikeri. Steps were immediately taken to check the spread of the disease and affected trees were cut hard back.

A thorough inspection was made of all citrus orchards in the Dominion and of nurseries supplying citrus trees, and in one nursery it was found necessary to destroy the whole of the citrus stock to prevent the risk of further contamination. The matter of compensation to growers and the nurserymen concerned is at present receiving the consideration of the Government.

Passion-fruit culture, which a few seasons ago promised to develop into an important industry, especially in the North Auckland district, has shown a gradual falling off, and the quantity of fruit produced was considerably less than in former years. The closing-down of the processing factory at Kerikeri, and the absence of systematic spraying precautions on the part of growers for the control of disease affecting the vines, are factors that have been largely responsible for the reduced production.

The cutting-out of a number of neglected orchards and other areas which had become unprofitable has slightly reduced the total area in commercial orchards in the Dominion, which now stands at approximately 26,500 acres.

The asparagus experimental area established last year on the Napier Lagoon reclamation has received regular attention in the matter of drainage and cultivation, and the plants are doing reasonably well. The area has suffered to a certain extent by unfavourable soil conditions brought about by the excessive rains recently experienced in that district.

Some 50 acres have been planted in asparagus by a private company in the vicinity of Hastings, and satisfactory progress is being made.

In view of the heavy losses of fruit caused by frost damage in a number of the commercial fruitgrowing districts, steps were taken to obtain the latest information relative to frost-control. Arrangements were made for Mr. W. R. L. Williams, Orchard Instructor, Alexandra, who had had considerable experience on this subject, to proceed to California in April last for the purpose of making a full investigation into the frost-prevention methods as practised in the orchards in that State, and also in the States of Oregon and Washington.

A valuable report covering his inquiries has been furnished by Mr. Williams, and the information obtained has also been disseminated by means of lectures which were given in the different fruitgrowing districts by Mr. Williams on his return.

As a direct result of his visit to America many orchardists who had not previously protected their crops installed frost-prevention equipment, while others enlarged their outfits, and, where the orchard was properly equipped and the firing done satisfactorily, growers who before suffered losses had good crops.

Export of Fruit.

The disastrous frost experienced in the Hawke's Bay district in October, 1936, considerably reduced the quantity of fruit available for shipment overseas during the 1937 export season.

The wholesale purchasing of fruit by buyers for the local markets, owing to the loss of fruit in the district in question, also affected the export quota. As a result the total quantity exported for that season was 944,753 cases (902,337 cases apples and 42,416 cases pears), which was the lowest quantity exported in any one year since 1927. Of these, 675,865 cases apples and 35,696 cases pears were consigned to Great Britain, 76,627 cases apples and 633 cases pears to the Continent, 71,580 cases apples to North America, 47,060 cases apples and 6,087 cases pears to Sweden, 25,000 cases apples to South America, and 6,205 cases apples to the East.

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

The bulk of the fruit reached its destination in good condition, and, while the prices realized for the earlier shipments were considered satisfactory, values gradually declined as the season advanced.

The demands on the guarantee were fairly considerable, amounting to £27,481.

The following figures show the quantities of fruit (apples and pears) exported from the Dominion during the last five years: 1933, 1,430,513 cases; 1934, 1,574,912 cases; 1935, 1,063,420 cases; 1936, 1,228,286 cases; 1937, 944,753 cases.

As the present season's (1938) apple and pear crop is a particularly good one, it is anticipated the total shipments will exceed one and a half million cases. The first of the season's fruit for overseas markets was despatched per m.v. "New Zealand Star" on the 7th February, and consisted of 9,059 cases apples and 39 cases pears.

As the result of a petition signed by not less than 70 per cent. of fruitgrowers in the Provincial District of Otago the provisions of Part I of the Fruit Control Act, 1924, have been reapplied to that district, which now comes under the scope of the New Zealand Fruit-export Control Board.

Local Markets for Fruit and Vegetables.

The markets were well stocked with both fruit and vegetables, and prices realized were, in the main, considered satisfactory.

While some very fine lines were sent forward, there was a tendency on the part of some growers to anticipate the new season's market by forwarding consignments in an immature condition under the erroneous impression that good prices would be realized for this class of fruit.

The New-Zealand-grown Fruit Regulations 1938 came into operation on the 28th March. The regulations provide for an inspection levy to be collected by means of inspection-fee stamps on all apples, pears, and lemons sold on the local markets. In order to carry out the increased work involved it was necessary to appoint additional Fruit Inspectors. It is too early yet to report on the working of the regulations, but it is anticipated they will be favourably received by the bulk of growers, auctioneering firms, and retailers in the Dominion, and as their requirements become more generally known will result in the marketing of fruit being placed on a better basis than has existed in the past.

Imported Fruit, Plants, etc.

The inspection of all fruit, plants, bulbs, &c., imported into New Zealand either as freight or through the parcel post was carefully attended to at the different ports of entry by the officers detailed for this work. A considerable increase in the quantities of fruit and plants imported during the year is noticeable.

Exports from the Cook Islands and Fiji show an increase on the previous year's figures, as well as oranges and mandarins from Australia.

There was a large decrease in bananas from Tonga, due to damage to the plantations there by a hurricane.

The bulk of the consignments arrived in satisfactory condition, being clean and free from disease, and little difficulty was experienced as far as compliance with the import regulations was concerned. It was found necessary to fumigate a few small consignments of pine-apples for mealy-bug infection before delivery was given.

There was an increase in the quantity of seed, grain, &c., fumigated in accordance with the requirements of the regulations, and also ex store, on behalf of local produce-merchants, the usual fumigation fees being collected.

Fruit Cold Storage.

The finalizing of the results of the experimental work undertaken during the year, in conjunction with the Department of Scientific and Industrial Research, in connection with fruit cold storage was, unfortunately, somewhat interfered with by the sudden death of the Cool Storage Officer, Mr. R. Sutherland. The experiments included matters connected with the storage of fruit both on board ship and in the local cool stores.

Considerable attention was given to the handling of fruit on the wharves and to the methods of stowage and air-circulation on overseas vessels with the view of eliminating as far as possible wastage during transit.

Local cold-storage trials included the influence of oiled as against plain wraps in the control of superficial scald in apples and the use of copper-sulphate wraps in controlling the spread of grey mould in pears. In connection with the first mentioned, it has been ascertained that three important factors have to be taken into consideration– viz., (1) the state of maturity at which the fruit is picked; (2) the state of maturity when finally placed in cool storage; and (3) the cool storage temperature.

In regard to grey mould, this is more pronounced when a combination of seasonal and manurial effects are present, and some varieties appear to be more liable to attack than others.

The experiments, with a few new features, are to be continued during the coming year.

Numerous requests for advice on various phases connected with fruit cool storage were dealt with.

Instructional and Experimental Work.

There has been an increasing demand during the year for information and advice on the many phases connected with fruit and vegetable growing and horticulture generally. These requests have been met by correspondence and visits, and also by lectures and demonstrations on pruning, spraying, &c., given by the Instructors in their respective districts. An interesting feature is the number of persons with little or no experience who have taken up fruit or vegetable growing as a means of livelihood and who are desirous of proceeding on the right lines. These have been given every assistance not only in management generally, but also in the grading and packing of their produce both for the local and export markets.

The fruit grading and packing classes inaugurated some years ago have been continued in the main commercial centres, and a number of those attending the classes have gained the departmental certificate of competency in apple grading and packing.

Facilities have also been given for candidates to sit for the certificate in orchard pruning and spraying.

Those engaged in municipal, domestic, and commercial horticulture are keenly interested in anything that will raise the standard of attainment. The exceptional natural facilities in the Dominion for this class of production are being realized, and the quantity and high quality of fruit, vegetables, and flowers displayed in the shops and markets at all seasons are ample evidence of the fact.

Further progress has been made in connection with the orchard-research scheme commenced several seasons ago in co-operation with the Department of Scientific and Industrial Research. Of the twenty remaining fruit-tree manurial experiments, five have been closed during the year.

The most outstanding results secured were from the experiment on the liming of lemon-trees at Tauranga, in which the lime-treated plots increased their superiority over those unlimed. Indifferent results were obtained from the remainder of the trials.

The fruit-tree stock experiments (pip and stone fruit) are making satisfactory progress, and it is anticipated will provide some useful information in another season or two.

The testing-out of various spraying compounds and other materials for the control of diseases and insect pests has also received attention.

At the Research Orchard, Nelson, manurial experiments were continued, the results of which indicate that much valuable data will be available. A field-day held on the 24th June for the purpose of demonstrating methods of pruning was attended by some sixty orchardists. The orchard has now been wholly taken over by the Department of Scientific and Industrial Research.

Viticulture and Winemaking.

In the early part of the growing-season there was every indication of the vintage of wine grapes being above the average. Unfavourable weather experienced during the period of ripening, however, considerably reduced the crop in a number of the grape-growing districts.

In Hawke's Bay the season was one of the worst experienced for many years. Floods in January and heavy rains in February, combined with high temperatures, caused uneven ripening in the bunches, and many rotted before they were ripe.

The season's vintage is estimated at 167,500 gallons, which is in excess of that of last year (134,000 gallons), and is largely accounted for by the fact that a number of new plantations have come into bearing.

The crop of outdoor table grapes was also affected by the weather conditions, the setting generally being poor. As a result of the short crop good prices were realized. An increase is noticeable in the areas planted in table grapes, there being a big demand for vines and cuttings.

The returns from vines grown under glass have been satisfactory, and considerable extension is taking place in the number of glasshouses erected.

Cider-making.

Damage by frost to the 1937 apple crop considerably reduced the quantity of cider produced, the total production being estimated at slightly over 28,000 gallons.

Te Kauwhata Horticultural Station (Lower Waikato).

The weather conditions were favourable to the carrying-out of farming operations generally, including repairs to farm buildings, fences, &c. There was a continuous growth of grass, which provided ample grazing for stock. Sales of live-stock, wool, &c., amounted to £797 18s. 2d.

In the vineyard the prospects during the spring and early summer of a good grape crop were very promising. The damp conditions experienced in February, however, encouraged the development of grey rot (*Botrytis cinerea*), which rendered a considerable quantity of the grapes unfit for wine-making. As a result it is estimated the vintage will not exceed 10,000 gallons.

There has been a good demand during the year for wines produced at the Station, the total sales amounting to 10,128 gallons, which realized £7,323.

The public interest in vine-growing, both for table and wine-making purposes, continues to increase, and considerable quantities of vines and vine-cuttings were again sent out in July and August.

The financial position of the Station is satisfactory, receipts exceeding the general working-expenses by some £2,000.

Tobacco-culture.

The past season has been a satisfactory one for the production of tobacco-leaf, the summer being exceptionally fine, with sufficient rain to keep the crop growing well.

The total area planted for commercial purposes was approximately 2,800 acres, as compared with 3,776 acres for the previous year. The bulk of the area was in the Motueka district, where some 2,500 acres were cultivated, the acreage in other districts being Nelson, 220 acres and Auckland, 50 acres. In the Motueka and Nelson districts, where the main tobacco-producing areas are situated, there are some seven hundred growers each cultivating on an average from three to five acres, with a few reaching ten acres. Seasonal operations—planting, harvesting, &c.—give employment to a large number of persons.

There are approximately one hundred and fifty flue-barns or tobacco-kilns operating, some of the larger growers owning three kilns.

About half of the tobacco produced is flue-cured, producing a yellow-leaf tobacco, which is mainly used for the manufacture of cigarettes, the balance being air-cured for the manufacture into pipe tobacco. The season's crop having been favoured by suitable weather conditions, the bulk of the leaf is being harvested in very good order.

A further shipment of Nelson-grown flue-cured leaf was forwarded to London per m.v. "Port Dunedin" in October last, the consignment consisting of 82 tierces of a total net weight of 68,975 lb. The price realized was slightly lower than that obtained for the previous season's leaf; but taking into consideration the variation in quantities of higher-grade leaf of the two seasons the result was considered quite satisfactory.

In view of the larger quantity grown for export, it is anticipated some 200,000 lb. of 1938 leaf will be available for shipment overseas.

The Government has established a tobacco-reconditioning store at Motueka, and this will be available to deal with the season's crop.

At the Pongakawa Settlement, which is now under the control of the Forestry Department, some 43 acres were planted in tobacco as a side-line. The crop is estimated at 34,000 lb. of good-quality leaf.

Hop-culture.

The bulk of the hops produced in New Zealand is grown in the Motueka district. The past season has been a very favourable one for the production of hops, and heavy crops have been harvested. Heavy rain and wind just prior to harvesting caused a good deal of damage in some gardens, the vines breaking down with the extra weight. The ripening-period came on very quickly, and the crop appeared to mature much earlier than in previous seasons. This resulted in a fair quantity of the hops turning brown, rendering them unfit for use.

The hops produced were large, making picking easier, but were inclined to be on the light side. it is estimated the production will be in the vicinity of 4,500 bales to 5,000 bales, which is considerably in excess of that of the previous year.

The quantities and values of hops exported from the Dominion during the past five years ended 31st March are as follows:—

	Cwt.	Value. £	
1934	3,872	17,734	
1935	3,627	26,522	
1936	3,436	22,684	
1937	4,258	28,495	
1938	1,856	12,385	(poor season).

Tung-trees.

There has been no extension in the planting of tung-trees during the year. The original plantings which took place in various localities in the North Auckland district amounted to approximately 5,500 acres. It is doubtful, however, if any of these ventures under existing conditions will prove successful from a commercial point of view.

New Zealand Institute of Horticulture.

The New Zealand Institute of Horticulture continues to take an active interest in matters connected with horticulture generally, and from an educational standpoint its operations are destined to be of considerable benefit both to the horticulturist and the fruitgrower.

The Loder Cup, which was presented some ten years ago by the late Lord Wakehurst (Mr. Gerald W. Loder) for the purpose of encouraging the protection and cultivation of the incomparable flora of the Dominion, and which is competed for annually, was awarded for 1937 to the Auckland Institute and Museum in association with the name of its botanist, Miss Lucy M. Cranwell.

Registration and Inspection of Nurseries.

The inspection of all nurseries from which plants are sold as prescribed in the regulations governing the registration of nurseries was systematically carried out during the year. Reports to hand indicate that the majority of nurserymen take a keen interest in their work, which is evidenced in the clean condition of the nurseries and the high standard of stocks raised. In a few instances where disease was found on inspection to be present steps were promptly taken for its control.

Some 557 nurseries were registered during the year, the registration fees realizing £557.

has shown greater fluctuation in cobalt content than last year, and some recent samples have contained in the vicinity of only 10 p.p.m. While this may be sufficient to maintain stock health the amount required is almost certain to be greater than in the case of limonite containing ten times the amount of cobalt.

Supplies to Farmers: In view of the trouble experienced by many farmers in obtaining supplies of cobalt at reasonable prices, the difficulty of mixing the extremely minute amount required with salt for lick purposes, and the somewhat erratic cobalt content of limonite, it was decided to make cobalt sulphate available for sale to farmers. A red-coloured, strongly cobaltized salt giving, when mixed with agricultural salt at the rate of 1 lb. to 1 cwt., a product containing 4 oz. of cobalt sulphate per ton of lick, is sold at 2s. per 5 lb. bag. Cobalt sulphate is sold in 1 oz. bottles, with full directions for drenching, at 1s. per bottle. During February and March 348 bags of cobaltized salt and 321 bottles of cobalt sulphate were distributed to district offices for sale, and much larger orders are now coming to hand.

Iodine Survey of New Zealand Live-stock.—The concluding paper dealing with the iodine content of South Island glands covering the Nelson, Marlborough, and Westland districts and summarizing the results for the South Island as a whole has been published by Mr. D. F. Waters in the *Transactions of the Royal Society of New Zealand*. A final paper covering results from the North Island is in preparation.

Pica, Osteomalacia, Waihi Disease, &c.—Several occurrences of trouble with cattle or sheep, suspected of being connected with deficiency of phosphorus, or unbalanced phosphorus calcium ratio, have been investigated from the point of view of the percentage of these elements present in the pastures on which the animals were grazing.

On a property at Onewhero, near Tuakau, Raglan County, very persistent bone and stick chewing had occurred among dairy cows, and over a number of years young cattle and sheep had failed to thrive. Analyses at the Veterinary Laboratory had demonstrated low levels for inorganic phosphorus in the blood. Samples of soil and pasture, collected on a personal visit, when analysed supported the contention that deficiency of phosphorus was the cause of the trouble. The soils were leached volcanic ash loams with high lime requirement, high soluble alumina probably resulting in strong phosphate fixation, and with very low contents of total and available phosphoric acid. The pastures contained approximately 1 per cent. of calcium oxide, but only about 0·4 per cent. of phosphoric acid. It was subsequently demonstrated that feeding with bone-meal, when persisted in long enough, overcome the stock trouble.

In connection with an outbreak of bandiness in hoggets near Balclutha, turnips on which the animals were being fed were submitted by the Officer in Charge, Veterinary Laboratory, for analysis. The roots from Balclutha contained 0·43 per cent. calcium oxide and 0·75 per cent. of phosphoric acid on the dry weight, while other turnip roots from Ruakura for comparison contained from 0·6 per cent. to 0·7 per cent. of calcium oxide and 0·4 per cent. of phosphoric acid.

Mineral Deficiencies and Fruit Tree Growth.

A considerable number of citrus-tree leaves have been analysed in connection with a chlorotic condition of the leaves and general unhealthiness of the trees. Some indications of positive response to zinc spraying have been obtained by the Horticulture Division in the Tauranga area, and analyses point to a zinc content of the young leaves of from 5 mg. to 20 mg. per kilo. of dry matter being associated with such conditions, while healthy trees usually have above this level.

In the Auckland district joint investigations by the Horticulture Division and the Department of Scientific and Industrial Research indicate a deficiency of manganese as a contributing factor to chlorotic conditions, and leaves of the affected trees were found to vary in zinc content from 16 mg. to 31 mg. per kilo., and in manganese content from 5 mg. to 12 mg. per kilo.

Samples of leaves taken under a standard system have been obtained from manurial trials in apple orchards. The analyses when completed will be compared with results as indicated from qualitative and quantitative results on yield and vigour of the trees.

Pig Feeding and Carcass-quality.

A co-operative series of feeding experiments are being carried out at the Ruakura Farm to determine the effect upon bacon-quality of variation in the nature of the rations, and particular attention is being paid to hardness of fat as influenced by milk, grain, and pasture. Dr. F. B. Shorland is analysing the body-fat from selected portions in the carcass to obtain the distribution of the various fatty acids in an endeavour to correlate the composition of the fat with that of the food.

Vitamin A Content of Butters.

Through the kind assistance of the Director of the Dairy Division a series of butter samples are being secured from the grading-stores in the various districts with the object of determining local and seasonal variation in vitamin A and carotene content of New Zealand butters. A spectrophotometer is being secured for this and other related work, and will be used in conjunction with the Hilger spectrograph in the Dominion Laboratory.

Stock-foods.

Arising out of inquiries initiated by the Standards Institute, a survey was made of meat-meals, meat and bone-meals and pollards produced and sold in New Zealand. From the results obtained tentative proposals have been drawn up for standards covering these products. The proposals are at present under consideration by the interested parties. All the samples analysed were of a reasonably good standard, but some confusion appeared to exist in some cases as to the designation of particular products. Certain samples labelled meat-meal would more correctly be described as meat-and-bone meal, as they contained from 16 per cent. to 29 per cent. of ash.

Soils.

Maritime Soils Reclamation.—Regular sampling at six-monthly intervals of the reclaimed harbour muds and sands at Napier has been carried out and data supplied to the Lands and Survey and Public Works Departments, as well as officers of this Department, concerning changes in content of soluble salts. This data has been correlated with vegetation changes, cultivation practices, and results of cropping and grassing. In addition, mechanical and chemical analyses are being made on a number of representative samples, and changes in replaceable bases will be followed up from time to time.

Samples of soil were collected from reclaimed mud-flats of the Kaipara Harbour which were under consideration for sowing down to pasture. It was found that good ten-year-old pasture adjacent to the mud-flat had a content of 0·09 per cent. salt (NaCl) in the topsoil and 0·18 per cent. in the subsoil. Poor pasture had 0·19 per cent. in the topsoil and 0·27 per cent. in the subsoil. Experimental strips of the mud-flat that had been sown near to the drains with rye-grass and white clover had 0·10 per cent. salt in the topsoil and 0·38 per cent. in the subsoil, where both grass and clover were growing well, but where rye-grass alone was growing the figures for salt were 0·27 per cent. and 0·83 per cent. respectively for top and subsoil. Main areas of the reclamation growing only salicornia and other salt weeds had from 0·78 per cent. to 1·10 per cent. salt in the topsoil and 1·32 per cent. to 2 per cent. in the subsoil. It was recommended that no further sowing of grass be made except experimentally until the salt content of the main areas was reduced to the vicinity of 0·25 per cent. in the topsoil.

Soils from the bed of Lake Tuakitoto are under examination in connection with a proposal to drain the lake.

In connection with a proposal of the Fields Division to establish an experimental area on Mount Pisa Flats, Central Otago, analyses of the soil were carried out. The soils were found to be sandy loams or loams, low in water-soluble salts, slightly acid, with low lime requirements and well supplied with plant materials. Citric-soluble phosphate varied from 0·060 per cent. to 0·083 per cent. and total from 0·16 per cent. to 0·26 per cent.

A number of soils were analysed for officers of the Fields Division, acidity (pH), lime requirement, soluble salts, plant foods, &c., being determined. In addition, a detailed study is being made of the degree of correlation between the indications of various chemical methods of estimating available phosphate and potash and of observational pasture top-dressing trials. Lime-requirement methods are under similar investigation. The Crop Experimentalist and District Field Superintendents have selected certain mowing and grazing trials, and L.P.K. plots for these purposes and soil samples collected from the control strips are under analysis. Dr. E. B. Davies is carrying out these studies from the chemical side and is devoting some attention to improvement of the methods.

Two interesting soil samples were submitted by Dr. D. Cook, of the Health Department, who had been making an investigation of the health of the inhabitants of Pitcairn Island for the Imperial authorities. These soils were of lateritic type, red clays of volcanic origin, one from ground that had been continuously cultivated by the Islanders for a hundred and fifty years, the other from a virgin area. The analyses of the two soils were as follows :—

	Virgin.	Cultivated.
pH	7·3 (alkaline)	6·4 (acid)
Carbonate of lime	1·9	Nil
Nitrogen	0·420	0·257

Mineral Plant Food.	HCl Extract "Total."	Citric Extract "Available."	HCl Extract "Total."	Citric Extract "Available."
Lime	1·47	0·302	0·38	0·134
Magnesia	0·96	0·338	0·61	0·146
Potash	0·81	0·420	0·11	0·033
Phosphoric acid	1·85	1·010	0·05	0·031

The outstanding richness of the virgin soil would go far to explain why continuous cultivation without manuring has been possible for so long with little deterioration in the health of the inhabitants, if it could be assumed that the cultivated soil was originally of the same nature. Some further samples may be collected as opportunity offers to investigate this point.

In order that the greatest degree of co-ordination may be secured in planning soil investigations a Soil Committee has been set up consisting of representatives of the Cawthron Institute, Dominion Laboratory, Soil Survey, and of this Section.

Fertilizers and Limestones.

The usual routine testing of fertilizers has been continued and consultation maintained as required with the Registrar and Inspector of Fertilizers. Experiments are being conducted with a view to making the boron in borated superphosphate more slowly soluble so as to reduce seed injury.

A large number of commercial ground limestones and quicklimes have been analysed in connection with the granting of free railage concessions and a survey of the whole position that is being made by the Fields Division. In general the quality of these products is being maintained, but at times there has been a tendency for some of the lower-grade soft limestones to fall appreciably below 70 per cent. carbonate of lime and special attention has been drawn to these cases. In one instance the manufacturer disputed the analytical results, but on a personal visit being paid to the crushing-plant the discrepancy was traced to the use of a crude and inaccurate method of testing carried out at the works.

Fine earthy material from a "gusher" or bore at Kotuku on the West Coast, which was stated to stimulate growth (of pasture) was found to contain 90 per cent. carbonate of lime and 1·98 per cent. common salt. According to the Director of the Geological Survey, the carbonate of lime is present as aragonite. A number of other miscellaneous fertilizing-materials have been reported on.

Toxicological.

Zinc.—Two further experiments on feeding pure zinc lactate to pigs have been concluded at Wallaceville in an endeavour to determine the lower limit of toxicity. Levels of intake of 0·05 per cent. to 0·005 per cent. of zinc in the milk have again been associated with mortality and a non-specific arthritis. High amounts of zinc have been found in the organs. The total amount of zinc required to cause death has been as low as 37 grams given over two months. A third experiment feeding 0·5 gram of zinc lactate daily to weaner pigs is in progress.

Several cases of suspected poisoning of pigs from milk passed through galvanized-iron pipe lines have again occurred, and analyses have confirmed the presence of excessive zinc in the milk and in the organs of the pigs.

Arsenic.—The death of a number of cattle in the Blenheim district was traced to animals eating rubbish from a tip contaminated with sheep-dip. Appreciable amounts of arsenic were found in the organs submitted. Another case of mortality among cows following weed-killing operations was probably due to arsenic in the weed-killer.

A case requiring intensive inquiry has arisen in the Reporoa district. This isolated farming community lies to the south of the Waiotapu thermal area and also has a number of thermal and mineral springs scattered over it. Dairying, dry stock, and sheep farming are all carried on, but results, both in stock health and production, have never been as good as might have been anticipated. Continued unthriftiness and mortality of dairy stock on one farm led to an analysis being made of mud and water from a drain. Arsenic was found in both. Further investigation revealed that the mud deposited by the Waiotapu River was arsenical and that the swamp soils formed from this mud contained arsenic. The arsenic appears to be present both in combination with iron and as sulphide. Orpiment occurs in massive form in the sinters around some springs and as a finely divided precipitate in pools receiving the overflow from the Champagne Pool at Waiotapu, the waters of which contain arsenic in solution. A large number of samples have been collected, and a survey of the whole settlement is in progress, Mr. I. G. McIntosh using a portable field testing-set for this purpose. Among samples so far analysed up to 3·75 mg. As_2O_3 per 100 c.c. has been found in some drainage waters, 2·5 per cent. in muds, 0·3 per cent. in soils, 2·3 mg. per 100 gm. in dry matter of grass, and 0·6 mg. and 0·25 mg. per 100 gm. respectively in dry marrow and bone of femur of a cow that had died under suspicious circumstances.

Sand from a creek in the Tirau district suspected of causing gastrointestinal irritation in cows was found to be composed very largely of sharp flakes and splinters of volcanic glass.

In connection with heavy lamb-mortality in Canterbury associated with changing of feed from pasture to rape, analyses of several bulk samples of freshly collected rape were carried out. Only leaves and petioles were included in the samples. Dry matter varied from 16·6 to 21 per cent., hydrocyanic acid was nil, and steam distillation yielded only 0·003 per cent. volatile oil. The composition of the dry matter included reducing sugars 10·6 to 16·8 per cent., "total sugars" 25·84 to 33·0 per cent., lignin 5·7 to 24·8 per cent., cellulose 17·4 to 22·3 per cent., protein 15·7 to 21·7 per cent., lime (CaO) 1·82 to 2·36 per cent., phosphoric acid 0·83 to 1·08 per cent., potash (K_2O) 3·62 to 6·50 per cent., magnesium (MgO) 0·66 to 0·98 per cent., ash 10·0 to 15·2 per cent. It is apparent that rape is a rich feed, particularly in mineral matter, and may cause digestive upset on changing from poor pasture, but no evidence has yet been found of the presence of any toxic substance.

Samples from Fields Division, Experimental Areas.

Pastures.—Dry-matter determinations of pasture samples from mowing trials at Ruakura have been continued. This and related work is now being taken over by the Chemist stationed there.

Sugar-beet Trials.—Many analyses have been made of sugar beet from variety trails in a number of localities, mainly in South Canterbury and Hawke's Bay, sampled at intervals during the maturing of the crop. Sugar content has been high, varying in most cases from about 14 to 20 per cent.

Miscellaneous.

Several official samples of butters were analysed in connection with projected prosecutions under the Dairy Industries Act.

A so-called "sterilizer" for dairy use was found to be merely rosin soap. It was suspected of causing taint in cream.

A proprietary fungicide alleged to make workmen feel sick when mixing it with fertilizers was found to consist chiefly of hydrated lime and free sulphur with a small amount of aromatic resin. No toxic substance could be detected.

Samples of brine, cured citrus peels, sterilizing-tablets, &c., have been analysed and advice given in connection with the operations of the Tauranga Citrus Association By-products Factory.

Other miscellaneous samples include borax for purity; cod-liver oil for vitamin A content; waters for salinity (for the Public Works and Marine Departments), for wool-scouring, for irrigation, for cobalt content (0·0001 p.p.m. in Wellington tap-water), for the information of the Zoologist in connection with studies into the distribution of liver-fluke, and for stock consumption; rat organs for copper, iron, and cobalt in connection with feeding experiments carried out by the Research Officer in Animal Nutrition; a calculus from a sheep (presumably an enterolith) which proved to be a rare type composed of magnesium ammonium phosphate; pig-urines for iodine content following iodopin injections (for the Director of Pig Industry); pastures for manganese determinations from farms on which grass staggers occurs (for the Officer in Charge, Veterinary Laboratory); mushroom composts for pH (from the Plant Research Bureau); and seeds for demonstration of a viability test using sodium selenite.

Preliminary experiments were made for the Internal Affairs Department on the production of a poisonous lick to aid in the destruction of deer.

Meetings of the Chemical Divisional Committee of the Standards Institute have been attended and the Department's interests represented thereon. Progress has been made with proposals for standards for pollards and meat meals.

The usual routine testing of cattle-dips and meat-marking fluids, and preparation of glass-marking ink, have been continued.

Chemical Control of Ragwort.

The Agricultural Chemist at Ruakura, Mr. F. B. Thompson, reports as follows on investigations into the chemical control of ragwort commenced in June, 1937:—

"The ragwort-plants growing under cultivation in the previously established ragwort nursery on the farm were used to study the conditions for the most successful use of sodium chlorate and to see if a better weed-killer could be found.

"The first object was to trace the path of the chlorate in the ragwort-roots by chemical means, but this was not practicable as the oxidizing enzymes in the plants masked the chemical reactions of the chlorate. Fortunately, chlorate injury could be traced by a red coloration in the affected roots.

"Applications of several grams of chlorate on rozette plants completely defoliated the plants with subsequent disintegration of the crown. The roots were killed for several inches from the crown, but after several months the remaining lengths of the roots, which were perfectly healthy, sent up shoots which grew into new plants. Thus the place of the original plant would be taken, by, perhaps, a dozen plants.

"All the experiments, including absorption experiments from roots and leaves, indicated that the ragwort-plant has great difficulty in absorbing and translocating within its tissues sufficient sodium chlorate to kill the whole length of the roots. On the other hand, very little chlorate will completely defoliate the plant. Complete roots kills were obtained when sufficient sodium chlorate was applied. The doses had to be considerably larger than was first anticipated, the action, presumably, being by contact with chlorate in the soil.

"In some of the later experiments difficulty was experienced in obtaining root kills even with large doses. This was attributed to the extensive root-development of the plants owing to the loose cultivated soil. Roots were found at a depth of 22 in., while others has a spread of over 7 ft. Ragwort-plants growing in pasture have not such an extensive root system, and better kills have been obtained than in the nursery.

"In the later experiments emphasis has been placed on field experiments with ragwort-plants growing in pasture. The trials are to determine the quantity of chlorate required to produce complete root kills, the best method of application, optimum seasonal and weather conditions, and stage of growth. The effect of a vigorous pasture sward in choking out any live ragwort-roots resulting from chlorate treatment is being studied. The experiments covering these points include 120 treated and pegged plants on Ruakura Farm and an equal number on Mamaku State Farm, and over seventy plots on a farm near Putaruru. These applications were made in the summer and early autumn, and the results will not be available till the regrowth next spring has been determined. Further treatments will be made from time to time throughout the year.

"Analyses of soil, which had been treated with chlorate were made to trace the movement of chlorate through the soil. The material tends to remain on the top few inches, and when it is removed from there it is quickly washed into the subsoil.

"Comparisons were made between the effect of sodium chlorate on ragwort and on other weeds. Ragwort appears to be more difficult to kill owing to the limited translocation, but this point is to be investigated further.

"The above remarks apply to sodium chlorate, but they are equally applicable to Atlacide, a commonly used proprietary weed-killer which consists largely of sodium chlorate and which has a similar action on ragwort.

"Other weed-killers were tried on plants in the ragwort nursery—for example, the sulphates and nitrates of both copper and zinc. With each of these compounds it required approximately 15 grams to produce an effect similar to that resulting from 1 gram of sodium chlorate. Three groups of weed-killers, dichromates, thiocyanates, and bisulphites were compared with sodium chlorate and the compounds were tried when combined in pairs. In experiments, both at Mamaku Farm and in the Ruakura nursery, sodium chlorate proved to be the most efficient.

"In spite of the difficulty of obtaining complete root kills of the ragwort, the use of sodium chlorate is undoubtedly enabling many farmers to replace almost pure stands of ragwort by productive pasture swards. Often large numbers of small ragwort-plants come up from live roots. In sheep pastures these remain small and harmless. Dairy-farmers have, by treatment of regrowth, changed badly infested areas into comparatively ragwort-free pastures. On the other hand, much of what has been attributed to re-seeding is undoubtedly the result of incomplete root kills."

SAMPLES RECEIVED FOR ANALYSIS DURING THE YEAR.

Wellington Laboratory—			
Field crops	13		
Animal organs for trace elements	103		
Pig-carcass specimens	11		
Butters	32		
Pastures for trace elements	255		
Pastures for Fields Division	253		
Sugar Beets	392		
Fruit-tree leaves	160		
Fertilizers	32		
Stock foods	38		
Limonites	30		
Toxicological specimens	185		
Waters	41		
Stock Remedies	13		
Dips	19		
Limestones	293		
Soils	300		
Thyroids	3		
Miscellaneous	60		
		—	2,233
Ruakura Laboratory—			
Soil samples for chlorate determinations	49		
Soil samples for moisture determinations	47		
Pasture samples for dry matter determinations	20		
		—	116
Total			2,349

NAURU AND OCEAN ISLANDS PHOSPHATE.

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

DETAILS of operations at Nauru and Ocean Islands for the eighteenth year under Government ownership are supplied herewith. The year terminated on 30th June last, and the shipments as compared with the two previous years are as follows:—

	1935–36. Tons.	1936–37. Tons.	1937–38. Tons.
Nauru	506,600	577,600	836,250
Ocean Island	319,779	429,000	329,850
Total	826,379	1,006,600	1,166,100

It will be noted that the two previous years' figures which established records considerably above any former years have again been exceeded, the total of 1,166,100 tons being up by 159,500 tons. A still further increase is aimed at for the present year, as the demand for phosphatic fertilizers in New Zealand and Australia continues to expand rapidly. This is instanced by the following figures giving the distribution of shipments for the three years:—

	1935–36. Tons.	1936–37. Tons.	1937–38. Tons.
United Kingdom	6,000	17,225	15,650
Australia	561,200	683,475	771,150
New Zealand	192,879	243,400	290,300
Other countries	66,300	62,500	89,000
	826,379	1,006,600	1,166,100

The proportion of output which came to New Zealand was 24·9 per cent., as compared with 23·34 per cent. for 1935–36 and 24·18 per cent. for 1936–37.

Importations to New Zealand compared with the two previous years are: 1935–36, 199,237 tons; 1936–37, 246,778 tons; 1937–38, 293,830 tons.

During the year under review very favourable weather conditions have again been experienced; the health of the Island staffs and labourers has been good, and there have been few labour troubles.

The mining and artificial drying-plant and the shipping arrangements at both Islands have given excellent service under heavy pressure. In view of the expanding demand it has been decided to materially increase the plant facilities during the next few years.

The Commission's m.v. "Triaster" and s.s. "Triona" continue to make fast trips between Australia and New Zealand and the Islands, the former having now delivered a total of thirty-seven cargoes and the latter seventy-one in the two countries, besides doing any necessary mooring and labour recruiting work at the Islands.

The new m.v. "Trienza," owned by the Commission, with a phosphate-carrying capacity of 9,300 tons, entered the trade early in April, and making fast trips has already delivered three cargoes in Australia. Her next trip will be to Auckland in July. A fourth vessel, the "Triadic," a sister ship of "Trienza," is due at the Islands early in July on her maiden voyage.

Approximate Cost of Paper.—Preparation, not given; printing (1,000 copies), £85.

By Authority: E. V. PAUL, Government Printer, Wellington.—1938.

Price 1s. 3d.]