1946

NEW ZEALAND

DEPARTMENT OF AGRICULTURE

ANNUAL REPORT FOR YEAR 1945–46

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

SIR,—

I have the honour to forward for Your Excellency's information the report of the Department of Agriculture for the financial year ended 31st March, 1946.

The report provides a summary of the principal farming activities of the year and outlines the comprehensive and numerous activities of the Department.

The accompanying statement by the Director-General of Agriculture outlines the production programme for the 1946–47 season and discusses a long-term policy of agricultural development in the Dominion. The reports of the Directors of Divisions cover all phases of the Department's work.

I have, &c.,

B. ROBERTS,

Minister of Agriculture.

His Excellency the Governor-General.

ANNUAL REPORT OF THE DIRECTOR-GENERAL

THE world-wide crisis in food-supplies has been emphasized during recent months, and as a result the importance of New Zealand as a source of supply of animal fats and proteins has been brought into prominence. Shortages will not be overcome for several years, and the present drive for greater production represents the commencement of orderly and progressive development of farming in the post-war era.

During the war, apart from special seasonal efforts in the production of food and fibre crops, the Dominion followed and was asked to follow its traditional methods of live-stock farming leading to the production of dairy-produce, meat, and wool. Spectacular increases in animal products cannot be achieved in a few years even in peacetime, for increased production requires the provision of additional breeding animals and more pasture lands or improvement in carrying-capacity on existing pasture lands.

In spite of innumerable difficulties due to shortage of labour and materials, production on the average, increased during the war, as is shown in the following table :—

LIVE-STOCK PRODUCTION

(In long tons)

—	Butterfat : Year ended 31st July.	Meat : Year ended 30th September.	Wool : Year ended 30th June.
Average of five seasons, 1934–39 ..	189,900	470,000* (Three seasons only)	134,000
Average of six seasons, 1939–45 ..	191,600	528,000	151,000

* Years ended 30th June.

CASH CROPS : ACRES IN CROP

—	Areas threshed.					Commercial Areas outside Boroughs.		
	Wheat.	Oats.	Barley.	Maize.	Peas and Beans.	Potatoes.	Onions.	Total.
Average of five seasons, 1934–39	214,200	63,400	22,400	6,900	19,100	21,900	800	348,700
Average of six seasons, 1939–45	243,900	61,000	31,200	8,200	35,100	22,200	1,100	402,700

During the war years the chief directing influence was secured through District Primary Production Councils. They carried out the policy of the National Council, which acted in an advisory capacity to the Minister on matters pertaining to seasonal production programmes as required by the exigencies of war and which organized rationing of essential supplies and the provision of labour. Production Councils were disbanded subsequent to the cessation of hostilities, and an arrangement has been made to secure the co-operation of the Federated Farmers whereby the Dominion programme for production is being diffused to producers through the Federation's district organizations so that all factors which may limit production can be fully investigated and rectified, as far as is possible.

PROGRAMME FOR THE 1946–47 SEASON

The difficulties created by the past summer's drought in the North Island (and which might have severely curtailed next season's dairy and meat production) have been largely overcome by bountiful autumn pasture growth and fodder-supplies transported to the northern dairying districts from the South Island. Although the autumn weather did not favour the preparation of land for autumn-sown cereals in the South Island, the essential features of the following production programme should be capable of fulfilment :—

Meat	530,000 tons.
Butterfat	190,000 ,,
Wool	160,000 ,,
Wheat	250,000 to 300,000 acres.
Oats for threshing	50,000 acres
Malting-barley	40,000 ,,
Feed barley	15,000 ,,
Maize	12,000 ,,
Potatoes	25,000 ,,
Onions	1,000 ,,
Peas	45,000 ,,

Whilst every endeavour should be made in the present period of food shortage to achieve as large a measure of self-sufficiency in cereal production as is possible, the Dominion can make its greatest contribution by developing meat and butterfat production to the maximum, for it is in live-stock farming that New Zealand possesses very definite natural advantages. Particular attention must be given to dairying by the more adequate feeding of existing herds, the control of disease, and the building-up of herds to the maximum.

Pasture-production should be assisted during the coming and future seasons through increased supplies of phosphatic fertilizers for top-dressing, but the full benefits of improved fertility can be secured only if adequate attention is paid to the conservation of all surplus summer growth as hay and silage. Adequate winter feeding is essential if maximum butterfat-production is to be secured.

The control of disease and live-stock mortality is essential in the economic development of dairy production. The field veterinary staffs of the Department of Agriculture and of veterinary clubs are being strengthened and should be of great assistance in this direction. Services rendered to the industry in the control of abortion through vaccination should eventually almost eliminate the toll this disease takes of dairy herds. Mortality, especially in young animals, can be greatly reduced by increased attention to feeding, and investigations carried out at Ruakura Animal Research Station have shown how important adequate feeding is in reducing calf mortality.

The immediate objective in the dairying industry is to regain lost ground, and we should attain a total of 1,800,000 cows in milk by the 1949-50 season. To do this there is an obligation on every dairy-farmer to increase the number of suitable heifer calves raised in the springs of 1946 and 1947 above that of his normal replacement requirements. Each dairy-farmer should save the best two out of three normal heifer calves dropped between the commencement of the season and the date beyond which it is not usually satisfactory to save calves, and quality heifer calves should not be allowed to die because of inadequate feeding.

Long-term Development of Farming

In the past it has been accepted that the abnormal demand for food from exporting countries during war and its immediate aftermath may not be maintained in the post-war period. It is not that the world need for food lessens, but the free flow between food-producing and industrial countries is hindered by post-war slumps which have been regarded as inevitable. From the recent conflict has emerged the general philosophy that nations which were united in war must be united in peace and that all countries adhering to the United Nations Organization should adopt policies of full employment to secure to their peoples the level of nutrition and social amenities necessary for a full life. In past and coming international conferences the nations are working toward freer trade, full employment, and better nutrition. New Zealand produces high-quality animal fats and proteins which are so essential for better world nutrition, and provided full employment can be maintained in the great industrial countries there should be no difficulty in disposing of all the animal products the Dominion can produce.

An expansion of production for export must follow on traditional lines of live-stock farming, although attention must be given to diversification. For instance, the production of farm and horticultural seeds of certified high quality promises to allow of a more diversified export trade. Farming for domestic consumption can also be increased to provide sufficient fresh and preserved fruits and vegetables for adequate nutrition of the Dominion's population, and in many cases this development will result in surpluses available for shipment overseas.

The aim in the long-term development of farming should be to make the greatest use of the Dominion's land resources; to farm the more fertile areas to the highest level; to check erosion and reversion on marginal land; to bring into cultivation all the worthwhile areas of undeveloped land; and to improve farm living and working conditions.

In catering for export markets, an increase in dairy products would provide the most favourable and immediate avenue for employment. As New Zealand produces dairy products with less effort than any other exporting country, the scope for expansion in a

world economy based on freer trade would probably be greater than the Dominion could meet in the near future. As has already been stated, the Dominion target should be to increase the dairy herds to 1,800,000 cows in milk by the 1949–50 season. A further increase to 2,000,000 cows could be reached by 1954–55 and to 3,000,000 by 1975. Such an increase in dairy production would not necessarily retard steady expansion in the meat industry, for in effect it would represent an intensification of farming practices on the better and more suitable land of the Dominion.

The maximum use of the soil and stock of the Dominion requires an extensive developmental programme. This programme must include—

(*a*) Rapid improvement in the developed lands of the Dominion.
(*b*) Development of ploughable scrub lands in the North Auckland and Auckland Land Districts.
(*c*) Development of irrigation in the South Island.
(*d*) Swamp reclamation.
(*e*) Control of erosion and reversion on hill country.
(*f*) Improvement, erection, and repair of farm homes, buildings, and fences.
(*g*) Diversification of production.

Both ploughed and surface-sown grasslands in the North Island are capable of increased production through the wider use of lime and fertilizers, improved strains of grasses and clovers, subdivision, and more adequate feeding of live-stock. Every endeavour must be made to obtain raw materials and to modernize manufacture and distribution of fertilizers and lime with the objective of at least 1,000,000 tons annually of each commodity being available to farmers within the next few years. Maximum production cannot be achieved until both fertilizers and lime are so freely available that farmers can obtain them on their farms when and in what quantities they require.

The settlement of returned servicemen will be an important factor in securing increased production from the developed lands of the Dominion as well as bringing into production considerable areas which are at present indifferently used. At least 50 per cent. of the servicemen settlers will be dairy-farmers, and, apart from those taking over established dairy-farms, new establishments will probably require at least 100,000 cows to be added to the Dominion's dairy herd.

As soon as fertilizers are freely available, the development of the better-class pumice lands in the Rotorua-Taupo area can be recommenced. This district offers the largest area of available land for new settlement and in the primary stages provides an excellent opportunity to increase beef-production, which might otherwise suffer by the change over from fattening-farms to dairying. North Auckland also contains considerable areas of scrub land suitable for development if properly watered, cultivated, limed, and fertilized.

Irrigation in the South Island will provide scope for closer settlement. At present completed irrigation schemes cover 89,000 acres, schemes not yet completed 170,000 acres, and projected schemes 272,000 acres, making a grand total of 531,000 acres. When all the works are in operation they will provide improved pasture land capable of adding at least a million ewes to our breeding-flocks for the production of fat lambs and will thus compensate the sheep industry for land lost to dairying and for hill country withdrawn from grazing owing to erosion and deterioration.

A proper use of fertilizers and high-quality seeds is essential in good pasture management. Extensive areas of land carrying grass are not, however, in a physical condition calculated to give maximum returns, due to inefficient drainage. This also applies to many swamp areas which have been reclaimed through comprehensive drainage schemes. The scope for land improvement through proper control of the water-level is tremendous and justifies large-scale capital expenditure in the future. Similarly, certain swamp areas not previously exploited offer scope for additional settlement. For instance, the projected drainage and land-development scheme for Lake Wairarapa will provide for the settlement of an additional 200 families as dairy-farmers, but many more families may be established if the better land is used for vegetable-production to meet the growing demands of the Wellington market.

New Zealand has serious problems in soil erosion and land deterioration which must be faced in the immediate future. The main areas affected are the surface-sown hill country of the North Island and the tussock grasslands of the South Island. It is essential that as large an area as possible of the hill pasture lands of the Dominion be kept in production, for the extensive grazier supplies a very large proportion of the store and breeding stock for the fatteners on more fertile country. No land should be retired from farming without very careful investigation, for methods will undoubtedly be found to check erosion through better pasture management and spaced plantations, and much reverted country may be reclaimed when fertilizers and labour are available.

In addition to the adoption of improved soil, pasture, and stock-management practices, increased production will be greatly influenced by the rapidity with which deferred maintenance work can be carried out on farms. During the war, owing to shortage of labour and materials, fencing, scrub-cutting, destruction of noxious weeds, ditching, and the repair and replacement of farm buildings and houses have all been neglected, and must now be corrected as rapidly as circumstances permit.

Additional farm dwellings are required not only for the replacement of old houses and for the settlement of new farms, but also for the accommodation of farm workers and workers engaged in the processing of primary products. One of the difficulties confronting farm workers is to secure positions where houses are provided, and men often leave farm employment when they marry owing to lack of suitable accommodation. One possible solution for this difficulty would be the development of co-operative groups to provide general farm labour. A number of farmers by joining forces could well guarantee full employment and make the erection of houses for the accommodation of workers a sound investment.

In addition to the development of live-stock farming, there is scope for expansion of certain forms of more intensive land use. As population increases, the fruit, vegetable, poultry, and honey industries must be developed, and some of these industries provide quite substantial export surpluses. The Dominion produces high-grade pasture- and lawn-grass seeds, and an expanding market for these may be built up in the future. With proper attention to quality through the Department's certification scheme it should be possible to expand seed-production of farm and horticultural seeds to provide domestic and export requirements.

The development of farming enterprises as outlined will provide greatly increased employment on farms, in industries which process and transport primary products, and in organizations servicing farmers. Farm employment should rise to 239,000 full-time units, and many more would be engaged in land development and reclamation work.

Co-ordination of Effort

This brief survey of the long-term development of farming would not be complete without some comment on how such a programme could be carried out. It is based on the belief that (1) international action will promote freer trade; (2) better standards of nutrition will be achieved; (3) the Dominion will be able to make the fullest use of its national resources; and (4) that expansion of dairying is likely to provide the most acceptable exports and at the same time allow of the fullest use of the Dominion's most fertile land. There will be difficulties and reverses in the expansion of world trade in foodstuffs, and the productive effort of the Dominion may at times have to be shifted to alternative products—*i.e.*, an increase in dried milk may be required at the expense of butter and cheese. During the transition period from war to peace and in the development stages of freer international trade some continuation of the wartime practice of targets of production will be necessary, and close collaboration between the Department of Agriculture and the farmers of New Zealand must be ensured at all times. The present collaboration with the Federated Farmers to increase production during the world food crisis must be continued as the foundation of an expanding phase of primary production to meet the export demands in the post-war era.

E. J. Fawcett, Director-General.

ACCOUNTS DIVISION

REPORT OF L. C. SCOTT, ACCOUNTANT

Although the estimated net expenditure for 1945–46 decreased by £91,475 on the 1944–45 estimated requirement, this was not in any way due to reduction of departmental activities. In fact, estimated expenditure amounted to £1,557,951, being an increase of £230,205 on the 1944–45 total of £1,327,745. The distribution of estimated increased expenditure applied to every subdivision of the vote. Two additional subdivisions were included (Rural Development, £10,700, and Milk Marketing, £24,000), but the expenditure effects from these were offset in that £33,000 provided annually in previous years under vote "Agriculture" by way of "Grant to New Zealand School of Agriculture" became a vote "Education" matter. It is thus apparent that the decrease in estimated net expenditure was in expectation of credits-in-aid. The 1944–45 estimate was £177,125; that for 1945–46 was £498,805. The Treasury planned to recover £294,000 in relation to the lime, fertilizer, and farm-produce items of the "Miscellaneous Services" subdivision. The remainder of the increase (£27,680) applied to all subdivisions of the vote by way of relatively normal fluctuations from planned expansions or as envisaged from other primary production trends.

A summarized statement of the vote, with 1944–45 figures in parentheses for comparative purposes, is given below:—

	Expenditure.				Revenue.			
	Appropriated.		Paid out.		Appropriated.		Received.	
	£	£	£	£	£	£	£	£
Administrative services ..	851,492	(660,616)	818,157	(657,491)	169,055	(148,270)	190,568	(169,551)
Miscellaneous advances, &c.	590,727	(558,130)	575,486	(564,788)	327,250	(26,855)	234,571	(35,029)
Payments under statutes	91,732	(109,000)	93,426	(115,427)	2,500	(2,000)	2,245	(2,811)
Milk Marketing Division ..	24,000	(..)	7,994	(..)	..	(..)	217	(..)
Totals	1,557,951	(1,327,746)	1,495,063	(1,337,706)	498,805	(177,125)	427,601	(207,391)
Less credits-in-aid	498,805		427,601					
Net totals	1,059,146		1,067,462					

Since the 1938–39 year, when the vote net expenditure first exceeded £1,000,000, the demands of war have had mainly limiting effects on the progressive development of departmental activities. Except in the years 1940–41 and 1941–42, when heavy superphosphate subsidy charges were borne, the financial provisions in vote "Agriculture" were theoretically only for departmental purposes, but in actual fact the vote has borne substantial war activity overhead. Reabsorption of man-power, previously divorced from normal departmental activities either in "Armed Service" or on duties associated with "Armed Service" requirements, had a tendency to reduce the limitation effects in 1944–45 and still further in 1945–46. The annual vote figures below are a broad background to these remarks:—

Year.	Gross.	Credits.	Net.	Year.	Gross.	Credits.	Net.
	£	£	£		£	£	£
1938–39 ..	1,240,805	162,379	1,078,426	1942–43 ..	1,067,527	171,163	896,364
1939–40 ..	1,121,323	150,986	970,337	1943–44 ..	1,199,753	182,353	1,017,400
1940–41 ..	1,775,443	163,459	1,611,984	1944–45 ..	1,337,706	207,391	1,130,315
1941–42 ..	2,052,497	172,065	1,880,432	1945–46 ..	1,495,063	427,601	1,067,462

By virtue of the Director-General of Agriculture being Primary Industries Controller there have been significant overhead effects from 1938–39 onwards to be borne by vote "Agriculture." It is unlikely that there will be completely informative groupings of figures available in the near future which will in any way fully disclose the financial effects of the activities of the Primary Industries Controller; those given below relate to direct chargings to War Expenses Account and concern only a few of the Controller's operations—mainly cool-storage and canning erections, certain butter and cheese

operations, Services' vegetable-production work, subsidies on superphosphate, encouragement of flax-production, table-poultry production, pig-production subsidy, and a number of relatively small cost items in support of Primary Production Councils and in publicity relating to drives for food production (for the Armed Forces, for Great Britain, and for consumption within the Dominion itself):—

Year.	Gross.	Credits.	Net.	Year.	Gross.	Credits.	Net.
	£	£	£		£	£	£
1938–39 ..	..	..	..	1942–43 ..	1,281,573	6,887	1,274,686
1939–40 ..	..	..	..	1943–44 ..	2,089,273	736,248	1,353,025
1940–41 ..	..	..	..	1944–45 ..	2,740,300	998,992	1,741,308
1941–42 ..	438,806	..	438,806	1945–46 ..	2,694,310	2,598,530	95,780

Reverting to an examination of vote "Agriculture," 1945–46 receipts (£427,601) and payments (£1,495,063), resulting in the net excess of payments (£1,067,462), it is interesting to note that "Administrative services" called for payments totalling £818,157 and yielded £190,568 credits (net being £627,589); that "Miscellaneous advances, grants, subsidies, &c.," cost £575,486, with credits of £234,571 (net being £340,915); that "Payments under statutes" required £93,426 and yielded credits of £2,245 (net being £91,181); and "Milk Marketing Division," £7,994, less credits of £217 (net £7,777). As usual, the outgoings have been comparatively much more substantial than incomings. There are, however, other receipts (£315,389) not covered by vote figures—Meat Act, £63,261; subsidy recoveries, £241,908; sundry, £10,220. Also, there are several Deposit Accounts to which credits of £18,102 have passed, and from these £14,121 has been paid out.

Administrative Services

The major expenditure factor was remuneration for personal services (£490,078); locomotion (£76,239) was essential for the efficient functioning of a substantial proportion of the officers receiving this remuneration. Other working-expenses (£251,840) were, in the main, for the three large farms or stations, the many small areas, the two research laboratories, the Seed-testing Station, the field crops and experimental work, the rabbit-destruction work, the Publications Section, the numerous grading services, together with heavy transfer expenditure and the usual substantial charges for office accommodation, telephones, stationery, &c.

The year has been one of marked expansion in the activities of the Publications Section. This was to be expected in connection with the bulletins, as in preceding years shortage of paper had caused important issues to be deferred. Of 253,000 copies of various bulletins received from the printers, 212,000 were distributed. There was a monthly output of 25,000 copies of the *Journal of Agriculture* in the early years of the war, but this declined to under 17,000 in 1942. At the close of 1943–44 demands were met by 20,700 copies, rising to 29,500 in 1944–45 and to 47,500 at the close of the 1945–46 financial year. Both staff and space expanded during the year, and the question of additional mechanical aids has received appropriate consideration.

Miscellaneous Advances, Grants, Subsidies, etc.

A feature of the payments under this heading is the wide distributive incidence of same. Carriage of lime, fertilizer, and farm produce absorbed £504,051; noxious-weeds eradication, £25,365; cow-testing organizations, £14,474; advances to pig industry, £8,727; bursaries to veterinary students, £5,357; sundry, £17,512. There are "recovery" aspects to carriage (£207,816), pig industry (£8,776), bursaries (£4,180), and noxious weeds (£12,758). In the long-run the offset effects in carriage and pig-industry items become complete; in the bursaries item all but about one-sixth is recoverable in due course, and as the Meat and Dairy Boards share the costs, they also obtain similar recovery benefits in due course.

Payments under Statutes

Compensation for diseased live-stock, £38,084, and subsidies to Rabbit Boards, £55,342, are the only payments. There is a relatively small recovery, £2,245, from carcass disposals in connection with the compensation outgoings.

Milk Marketing Division

This is a temporary provision under vote "Agriculture." The payments, including all aspects of expenditure, amounted to £7,994, and minor recoveries yielded £217.

Jute control in 1945-46, with its incidences to stabilization, to absorption of used bags, to conservation of overseas funds, and to availability of transport from India, has had to be correlated to anticipated crop-production and to estimated importation of wheat, rock phosphate, &c. Certain aspects of flax (*Phormium tenax*), serpentine, motor-vehicle carriage of fertilizer, and other subsidies have also absorbed time in supervisory capacity not directly related to normal accountancy responsibilities.

LIVE-STOCK DIVISION

REPORT OF W. C. BARRY, DIRECTOR

A favourable autumn and winter season during 1945 resulted in an excellent lambing season with a very high percentage throughout the country. Losses of ewes from seasonal diseases were confined mainly to those areas where feed was scarce owing to prevailing dry conditions. These dry conditions were noted in Hawke's Bay and Poverty Bay, where losses from pregnancy disease of ewes were seen. In almost all other districts the seasonal conditions were favourable. A severe flood was experienced on the Taieri Plain in May, where root crops and pasture were rendered unsuitable for stock.

Although the winter was favourable for stock, the spring was cold and wet in many districts and the usual spring growth was retarded. In early summer dry conditions prevailed in the greater part of the Auckland Province and in Poverty Bay and Hawke's Bay. The dry weather persisted over so many months that a serious drought resulted, with lowered production from dairy herds, and a serious feed position arose. Any hay saved was required for herd maintenance in the affected areas, the outlook for the coming winter being serious. Although hay has been obtained from the South Island, a favourable autumn season is very necessary to provide some supplementary pasture. Dairy stock are in low condition for the coming winter and the possibility of spring losses is a very real one.

Associated with the drought conditions there were extensive forest and peat fires, and many areas were dried out to such an extent that pasture was in some instances destroyed. Fortunately, serious stock losses did not occur, but it was necessary to slaughter many light-weight lambs in some districts owing to the scarcity of pastures and absence of fattening crops. Although many districts experienced difficulty in watering their stock owing to streams and creeks drying up, the dipping of sheep was well carried out and the stock remain in clean, healthy condition. It is only natural under such dry conditions that a distinct fall in the production of dairy-produce must be expected.

HEALTH OF LIVE-STOCK

HORSES

The health of horses has remained good during the year and no serious outbreaks of disease have been recorded. Some cases of strangles occur from time to time, and during the drought period a number of horses were affected with grass staggers. Very little breeding of farm horses is taking place, in fact, the number of horses on farms is gradually declining. The breeding of thoroughbred horses is being actively pursued.

CATTLE

Diseases scheduled under the Stock Act

Tuberculosis.—The number of cattle condemned under the Stock Act for tuberculosis during the year amounted to 5,640, 4,922 being condemned on clinical symptoms and 718 as reactors to the tuberculin test. In each case compensation was paid in accordance with the provisions of the Act. The tuberculin test was applied to 14,656 cattle, of which 718 reacted, giving a percentage of 4·9.

The total number of cattle, exclusive of calves, examined at the various abattoirs and meat-export slaughterhouses was 674,948, an increase of 134,818 on last year's figures. Of these, 42,542, or 6·3 per cent., were found to be affected with tuberculosis in varying degree, a large percentage being only slightly affected. This indicates a reduction of 0·5 per cent. infection among cattle slaughtered in these premises.

The testing of herds is carried out on a voluntary basis, and it will be noted that 12,142 cattle were tested at the owners' request. In addition, 2,546 head of stock were tested at the various Government farms under the control of several Departments.

Included in the Statutes Amendment Act passed last session is provision for the testing of dairy herds, more particularly in the first instance those herds supplying milk for town-supply purposes. It is expected that a number of the herds supplying unpasteurized milk will be dealt with in the coming year in all milk-supply areas.

Actinomycosis (and Actinobacillosis).—During the year, 585 animals were condemned for this disease. Many affected animals were treated by the regular dosing with potassium iodide, and a number were treated by intravenous injection.

Malignant Growth.—The number of stock condemned was 196, compensation being paid in accordance with the Stock Act.

Anthrax.—The position in regard to this disease is quite satisfactory, no cases arising during the year. The vaccination of stock on farms previously affected is being carried out as a precautionary measure.

Blackleg.—The numbers of calves vaccinated against this disease in the affected areas were: Taranaki, 10,900; and Auckland, 39,320; making a total of 50,220. The Auckland district numbers show an increase of 2,923 vaccinations over last year, whereas the Taranaki figures were reduced by 5,672 when compared with the previous year.

There were 313 outbreaks in the Auckland district, compared with 302 the previous year. This involved the vaccination of 7,645 calves on 313 farms. In addition, 31,675 calves were vaccinated on 1,410 farms as a preventive measure. The diagnostic section of the Animal Research Station at Wallaceville continues to give field officers reports in cases where blackleg and malignant œdema may be confused.

Johne's Disease.—A total of 94 head of stock was condemned under the Stock Act for this disease, the majority being clinical cases reported in the districts of Taranaki and the Waikato. The disease has been seen on a number of farms for the first time during the year. Apart from dealing with clinical cases as they arise on the farms, it is very difficult to control the spread of the disease, and eradication of the disease is an equally difficult problem.

Non-scheduled Diseases

Mastitis.—Investigations into the various problems associated with this disease are carried out by the Animal Research Division, and field advice is given by officers of the Live-stock Division.

Contagious Abortion.—Vaccination of calves against this disease is now in its fourth year and the results of the first years are becoming apparent. Farmers generally are quite enthusiastic over the results obtained. The very great increase in the number of calves vaccinated in the intensive dairying districts has increased the work of field staff to a degree not visualized at the beginning. In addition to large numbers vaccinated by club veterinarians, officers in the Wellington district vaccinated over 20,000 calves. As the numbers continue to increase from year to year in a spectacular manner, it is necessary for farmers to assist the vaccinating staff in every way possible, otherwise it will be most difficult to meet all requirements in coming seasons. As it is, sound organization and co-operation will be necessary to avoid duplication of motor-running, and waste of valuable time could be avoided if all stock-owners provided yarding facilities and had their stock assembled for treatment. It will be realized that the expanding volume of work has to be carried out within a few weeks each season, so that the need for all assistance possible should be clear to every dairy-farmer. Departmental field officers are anxious to cover their areas as fully as possible, but if late applications are sent forward from areas already dealt with, a duplication of work is involved and possibly great difficulty in getting the work fitted in with other duties.

Temporary Sterility.—This type of delayed conception in dairy cows has again been reported during the year. The trouble mainly affected individual members in herds and no serious interference with the normal breeding programme will result. Although there is some evidence of vaginitis in nearly all affected animals, it is frequently difficult to state what is the actual cause in some cases. A careful watch has been maintained for *Trichomonads* in herds where the breeding history would lead one to suspect this organism. Trichomoniasis is very difficult to demonstrate, but as contagious abortion becomes controlled through vaccination it should be possible to determine whether trichomoniasis is a serious factor in the cause of abortion and subsequent sterility.

Grass Staggers.—A cold spring was experienced with an absence of any flush feed conditions, and it is noteworthy that the incidence of grass staggers and other calving troubles was much lower than in some previous years. Experience in past years has shown that where hay is fed out during the spring to supplement a rather tardy growth of pasture there is less tendency toward grass staggers and also to milk-fever.

The dairy herds are beginning this winter in poor condition owing to the drought, and with an absence of winter feed the position regarding next calving season gives rise to much anxiety on the part of herd-owners in the affected districts.

Milk-fever.—Owing to the absence of flush pasture growth in spring months this disease of dairy stock was not nearly so prevalent last spring. The good results obtained from the use of injections of suitable calcium salts have been so marked that very few owners nowadays use the old udder-inflation treatment. This is noticeable in seasons when the disease is prevalent, the demand for calcium gluconate being very high.

Ngaio Poisoning.—During a severe storm last winter many ngaio trees were blown down on Banks Peninsula. Herd-owners in the area affected lost a number of cattle owing to ngaio poisoning. A total of 73 head of cattle died, and some cattle which showed symptoms of poisoning made a slow recovery. Ngaio poisoning in stock has been reported on several previous occasions.

Parasitic Disease in Young Cattle.—The rearing of young dairy stock for herd-replacement purposes is an important part of farming in factory-supply herds. Although calf-scours and red-water take their toll of the very young calves, the later infestation of weaned calves due to parasitic attack is frequently the cause of more serious loss. Reports indicate that better feeding in autumn and winter go a long way toward helping to carry the calves through. Many owners are now using phenothiazine in the treatment of calves for worms, and although more expensive, there is no doubt that this worm medicine has superseded bluestone solution and most other worm medicine. Even with the best available treatment, young, sturdy, well-boned dairy stock cannot be produced unless the best animal-husbandry practices are followed in the sound feeding and management of this class of animal. The past season, on account of drought conditions in many parts of the North Island, tended to lessen infestation with worms, but it is feared that the scarcity of winter feed will prove severe on young stock.

SHEEP

The winter of 1945 was favourable to the sheep-breeder. The ewes wintered well and the lambing percentages were very good, creating a record. The weather at lambing-time was favourable, but lambs did not do well in the spring and early summer, the weather being cold and pasture growth rather slow. Later, dry conditions set in, constituting a drought in many parts of the Auckland Province and on the east coast. This resulted in lambs being sent forward for slaughter at lighter weights, even in the good districts. In the affected districts many unfinished and even poor lambs had to be killed, as no feed was available and the outlook for rape or other fattening crops was poor.

Some losses in ewes were experienced on high-country stations in Canterbury, and where loss did not take place the check caused by the snow was responsible for an increased incidence of pregnancy toxæmia. Otherwise, in the South Island generally, the loss from this disease was below normal, an early spring growth in Otago being a preventive factor.

The wool clip for the year will probably be lighter in North Island districts affected by the prolonged spell of dry weather, particularly in east-coast districts, where dry weather was experienced from September, 1945. The wool was light in condition, deficient in length, with many cotted fleeces in the clip. Tick stain is still bad in some districts, but is improving.

Dipping presented difficulty in the drought-affected areas, but, considering all factors, the shearing and dipping operations were carried out satisfactorily. Some dipping losses were experienced, and there is evidence to show that infection is picked up in

yards, where a good clean-up and more hygienic handling of sheep is necessary if these losses are to be curtailed. Infection of sheep with the blackleg organism is becoming more prevalent.

Infectious Entero-toxæmia (Pulpy Kidney).—In connection with the control of this disease, the District Superintendent, Dunedin, reports:

The losses in lambs four to six weeks old have been on a par with previous years, certainly not above average. This season and last season, probably aggravated by the wet conditions, there has been a recurrence at a later age, involving losses of lambs three to five months of age, which have been rather above the average.

The vaccination of ewes is extensively carried out. A demonstration on the technique of vaccination was given in the North Otago district to a group of farmers. This arose through a heavy loss of ewes (90 out of 1,000) from blood-poisoning where the instrument, use, and technique were obviously at fault.

As previously stressed, vaccination of ewes is a very valuable measure in the control of mortality in young lambs from pulpy-kidney disease, but the farmer carrying out this vaccination work should take extreme care in the handling of the vaccine to prevent its contamination, in the sterilizing of syringe and needles before use, and in all procedure connected with the operation, so as to prevent any risk of introducing infection from outside scources which might reflect discredit on the vaccine itself.

Lymphadenitis.—The inspection of carcasses for this disease at freezing-works was mainly confined to palpation methods. Owing to difficulty experienced at works in obtaining suitable labour to do incision of glands, it was impossible at several works to have this requirement complied with. It is hoped that with a return to more normal conditions the work will be undertaken satisfactorily.

Pregnancy Toxæmia (Ante-partum Paralysis) in Ewes.—The incidence of this disease was very low during the year, mainly due to good pasture conditions prevailing during the pre-lambing period. Where overstocking was in evidence in areas affected by dry conditions and the absence of green feed, some losses were experienced. Again a heavy snowfall in July in Canterbury was responsible for more than usual losses in early lambing ewes. The ewes due to lamb later were not affected to any extent.

Parasitic Gastro-enteritis.—Although internal parasites of sheep were prevalent in the autumn and winter of 1945, the dry summer experienced has had a good effect in reducing the parasitic larvæ on pasture and the parasitic intake of the young stock grazing in these dry areas. So far hogget losses have not been serious, but a great deal depends upon adequate feed during the winter months. In many sheep districts of the North Island the feed-supply position is not good.

Some losses in ewes continued to be reported in parts of Canterbury, particularly ewes in low condition that were suckling lambs. The drain of milk-production on an insufficient diet enables the worms to gain the upper hand and post-mortem examination reveals a heavy infestation of worms.

An increasing number of sheep-owners are using phenothiazine as a worm medicine, and generally very good reports are being received as to its effectiveness. Many tons are now being used annually in the treatment of young stock of all classes.

An investigation was carried out in the South Island into a pecular condition of lambs scouring on their mothers, thus reducing early fat drafts of milk lambs. An inquiry was carried out in the Lumsden and Wanaka districts. The problem was inquired into from the inorganic deficiency angle, as well as from a parasitic and nutritional angle. As the Lumsden area is interested in grass-seed production, and as similar trouble was also experienced in an area in Canterbury where grass-seed production is pursued, there is some evidence that sheep husbandry has been neglected in favour of seed-production. The nutritional side of the problem is a difficult one to solve, but in view of large paddocks and inadequate grazing control on areas concerned in seed-production there is every reason to suspect the type of feed available as being unsuitable for fat-lamb production. The affected lambs recover on feed and even on grass paddocks later in the season when the feed is more mature.

Contagious Ecthyma (Sore Mouth).—A number of outbreaks of this disease continue to be reported, mainly in South Island flocks. Vaccination, where carried out, has

been shown to be very effective in protecting against the disease. Demonstration of the method of vaccination is always available to farmers through the field officers of the Division.

Contagious Ophthalmia (Pink-eye).—Although reference is made to the disease as occurring in most districts, it does not cause much concern to owners. Affected animals tend to clear up spontaneously, and many suitable eye-lotions are available to owners to assist them to deal with the more persistent cases. Advice is always available from field officers.

Hydatid Disease.—This disease does not appear to be lessened in any way as a result of the provision of an effective worm medicine for the treatment of farmers' dogs. A campaign of compulsory dosing of dogs would be impracticable to supervise, so that if the dog-owners do not use the means available to them, the prospect of a reduction of the incidence of the disease in farm animals is not hopeful.

Facial Eczema.—It was feared that an outbreak of this disease might take place following the long dry summer. A few animals, both cattle and sheep, were affected on isolated farms, but fortunately no outbreak of a serious nature was met.

Liver-fluke and Black Disease.—This parasitic disease has shown a tendency to spread in the Hawke's Bay district. Coincident with the spread of the parasite there is the need to vaccinate the ewe flocks against black disease. The mortality to be expected from black disease is even greater than that from the parasite itself. However, as the parasite is mainly responsible for infection, it is essential to endeavour to control its spread.

Blackleg in Sheep.—This bacterial disease is being diagnosed frequently in specimens sent forward for laboratory examination following investigations into mortalities in sheep. In several districts where losses have recurred, vaccination of flocks has proved an effective method of control. The District Superintendent, Wellington, reports as follows:—

> Blackleg in sheep is being increasingly incriminated as the cause of death in many cases of the kind formerly put down to "blood-poisoning" or dipping losses. It occurs after docking in lambs, after lambing in ewes, after shearing or dipping sheep, more particularly the younger ones. The use of contaminated yards has been noted as an important factor in many outbreaks. Other cases occur in weaned lambs with no wound history. Vaccination using 2 c.c. of standard vaccine has proved very effective on properties suffering recurrent losses.

Cutaneous Myiasis (Sheep Blow-fly).—Little trouble was experienced from blow-fly strike during the year.

Foot-rot.—This disease continues to be troublesome to flock-owners in many districts. The dry season experienced has been a distinct factor in reducing the incidence of the disease during the summer months, but with rain now general latent infection is liable to flare up again. The preventive measures advocated, if adopted, afford a good degree of control.

Lice and Ticks.—Owing to water shortage some undipped sheep appeared in the saleyards. These were affected with lice and ticks, this being more noticeable in the East Coast district, where the drought was severe and prolonged, and dipping was impossible on some properties. In Canterbury small lines of sheep have been found affected with parasites, but most of the larger lines of sheep direct from stations were very clean, and at many of the fairs clean yardings were the rule.

The difficulty experienced by dip-manufacturers in obtaining adequate supplies of "Derris" for inclusion in dips during the war period has been detrimental to the work of controlling vermin, but this unsatisfactory position is now being rectified. The prevalence of ticks in flocks normally kept clean may, no doubt, be due to the absence of Derris in dips.

PIGS

The number of pigs slaughtered for the season 1945–46 at premises under inspection was 707,077, an increase of 54,507 over last year's figures.

Inspection of the carcasses at time of slaughter revealed that 58,674 carcasses were found to be affected in varying degree with tuberculosis, the percentage being 13·96 per cent. This is a decrease of 0·74 per cent. as compared with last year.

Diseases of Pigs

Tuberculosis.—This is one of the chief causes of condemnation of pigs on inspection. In the absence of any cheap and effective method of pasteurization of milk by-products, particularly skim-milk, the incidence of the disease in pigs will remain high unless the disease in dairy herds is reduced. The pig is so susceptible to the disease that the skim-milk forming the major part of the diet is an excellent medium for transmitting the disease from cow to pig.

Suipestifer Infection.—This disease continues to cause losses in several districts. There is evidence that the disease may be introduced on to clean properties through purchased animals.

Sarcoptic Mange.—One outbreak of this disease was reported and was successfully treated.

Necrotic Ulceration of the Skin.—This disease is still frequently seen on farms, and although a successful line of treatment has been recommended it is surprising that owners continue to find difficulty in dealing with the disease on proper lines.

Swine Husbandry

The report of Mr. H. M. Peirson, Superintendent of the Pig Industry, is submitted herewith :—

Production of Pig-meat.—March, 1946, marks the end of a year of adjustments and a return to pre-war normal practice.

The termination of our contracts with the United States Joint Purchasing Board in December, 1945, and the lifting of the restrictions on the sale of pork for local consumption has brought about a change in the kind of pig-meat produced, with the result that there has been a definite swing toward the production of pigs within the pork weight range of 60/120 lb.

While drought conditions may have been responsible in some measure for the increased killings of light-weight pigs, the general outlook is for pork, as this is the class of production best suited to the conditions and feed-supply of the average pig-producer.

During the war emphasis was placed on the production of bacon pigs, and in order to encourage this weights and schedules were lifted to include pigs up to 200 lb. The response by farmers to the demand made upon them for heavy-weight pigs was extremely gratifying. Although normally the production of pork carcasses is more favoured, this effort on the part of the producer to increase weights was continuous throughout the war years.

Much has been said about the drop in production, but this is more apparent than real when consideration is given to the difficulties the producer has been working under. By numbers pigs have reduced considerably, but on the tonnage basis of pig-meats produced, because of the increased average weight of carcasses as a whole, production has been maintained at a satisfactory level during the past four seasons.

For the twelve months ending 31st March slaughterings have improved by just over 56,000 carcasses and represent an increase by weight of 1,316 tons in excess of the previous year.

The production up to 31st March for the last six years is set out in the table below :—

Year.	Breeding-sows.	Total Pigs slaughtered.	As Pork.	As Bacon.	As Choppers.	Average Weight.	Total Weight of Pig-meat.
						lb.	Tons.
1941	100,378	986,985	433,068	505,478	48,439	118	52,170
1942	91,338	1,002,211	553,818	414,017	34,376	112	50,280
1943	81,882	839,882	392,996	410,561	36,325	120	45,191
1944	77,300	726,282	281,153	421,947	23,182	128	41,375
1945	77,202	678,834	178,300	479,759	20,775	138	41,874
1946	80,000*	734,937†	262,300	449,815	22,822	132	43,190

* Estimate only. † This figure includes farm killed pigs.

A reduction in the number of breeding-sows was to be expected with the change over from pork to bacon production, but with the reversion in favour of lighter average weights there will be a tendency toward an increase in the sow population. A move in this direction is already taking place on many farms, and the indications are that there will be an improvement in not only the number of sows carried, but the number of pigs produced per sow. Some time must elapse, however, before marked improvement is evident.

The structure of the pig industry is sound and an increase in pig-production can be looked for by March, 1947.

Crop-subsidy Scheme.—This scheme was introduced in 1944 for the express purpose of encouraging farmers to provide the feed-supply necessary to carry pigs through the winter months.

Imported feed-supplies upon which the pig-producer usually depends were unprocurable, and it was hoped that the £5 per acre subsidy would provide the incentive to make producers self-sufficient in this respect. The response to the scheme cannot be considered satisfactory as, of the 40,000 farms carrying pigs, only 5,023 claims were made in 1945, representing 19,664 acres. The position for the present season shows no improvement.

The claims made under the scheme for the two years in operation are as follows:—

Year.	Number of Claims.	Area of Crops.	Subsidy paid.
			£
1945	5,023	19,664	98,330
1946	5,017	25,129	125,645*

* Estimate only.

Pig-meat Prices.—From time to time during the year representations for an increase in the price of pig-meat have been made to the Economic Stabilization Commission. Data relative to costs and returns has been prepared by the Department and the National Pig Industry Council, and representations made to the Hon. Minister of Agriculture. This matter is receiving further consideration.

Feed-supplies.—A sufficient supply of feed meal for pigs has not been available for the past two years, and this has been a contributing factor against increased production. Meal is only a small but very necessary item in the pig-feed supply. In normal times it requires some 40,000 tons to meet this need, more than half of which is imported from Australia and the Pacific islands. The absence of these stock-feeds makes it increasingly difficult to stabilize the pig industry.

Grading of Baconers.—This has been in operation for eight years. In spite of the fact that there has been an increase in the number of heavy pigs, due mainly to the raising of weights to include pigs up to 200 lb., the grading percentages show little difference by comparison with previous seasons. Approximately 450,000 baconers have been graded, and the averages for the year ending March are 82 per cent. Prime 1's, 14 per cent. Prime 2's, and 4 per cent. Second quality. A revision of grading standards to provide a premium for Special Grade is receiving consideration.

Pig-carcass Competitions.—The establishment of official standards for judging pig carcasses has been finalized during the past season and has resulted in a uniform method being adopted at all carcass competitions throughout New Zealand.

There is little doubt that the baconer competitions held at most of the main freezing-works during the past six years have, to a very large extent, been responsible for the high standard of grading returns. These competitions intensify the necessity of all marketing factors and result in the pooling of information concerning the pig industry for the benefit of all. By the attendance of over 1,000 producers on different occasions opportunity has been given to stress the importance of increased production and other factors over a very wide area. The Department's thanks are due to the organizations co-operating in these activities, who were at all times most helpful, particularly in the matter of prize moneys offered.

National Instruction Service.—The value of the instructional and advisory service given by the District Pig Councils through the National Pig Industry Council is being appreciated more each year.

In every district new layouts for piggeries are being built, bringing the conveniences and accommodation for pig-keeping up to the level of other primary industries. On many farms makeshift pig accommodation has been replaced with that of the most up-to-date conveniences, and, while there is still much to do in this field, it is gratifying to report that this important work has been continuous during the war years. In this the distribution of the Department bulletin, "Layout and Construction of Modern Piggeries," has helped considerably.

Publications and Publicity.—The results of feeding trials and articles on pig management, housing, and bacon competitions have been published in the *Journal of Agriculture*, other farming papers, and the public press.

Service talks prepared by District Pig Council supervisors and approved by the Department have been broadcast regularly over all main stations.

Extensions for the Coming Year.—The services established in 1937 covering "pedigree-sow recording," "carcass-quality scheme," and "pig census," and discontinued to a large extent during the war, are to be again given prominence.

The preparation of lecturettes in the form of film strips has already commenced, and when completed will be distributed to all District Pig Council supervisors.

Meat Inspection and Slaughter of Stock

The standard of meat inspection has been maintained at a good level during the year. It was difficult, in fact impossible, in some cases for freezing companies to obtain the necessary assistance to carry out the incision of glands in mutton carcasses, as was the pre-war practice. Inspection of this class of carcass for evidence of lymphadenitis was therefore confined mainly to palpation methods.

Goats were killed in some numbers at two east-coast works, and the shipment of the meat was reported upon. Although only the best of the young goats were forwarded, it was disappointing to find that the resultant meat was not of a very high standard, but was suitable for manufacturing purposes. In the endeavour to increase our exports of meat to assist in meeting the famine position in Europe, goats are again being killed for export.

The grading of meat intended for local consumption has been carried out at abattoirs and freezing-works. Although in the main satisfactory, some difficulty is being experienced in a few centres through lack of proper facilities to enable graders to do the work as it should be done.

The total numbers of stock slaughtered at registered premises (rural slaughterhouses included) were: sheep, 4,997,229; lambs, 12,694,649; cattle, 736,717; calves, 981,730; swine, 715,383.

The table below shows the numbers of stock slaughtered during the past year at freezing-works only:—

Class of Stock.	Year ended 31st March, 1946.	Year ended 31st March, 1945.	Increase.
Cattle	507,440	374,225	133,215
Calves	941,660	923,192	18,468
Sheep	3,939,750	3,105,782	833,968
Lambs..	12,518,554	10,515,905	2,002,649
Swine	628,047	584,980	43,067

There has been a substantial increase in numbers in all classes of stock slaughtered. As will be seen from the above table, the numbers have increased all round. At the same time, one must take into account the peculiarity of the season, particularly the drought as it affected several parts of the North Island. Stock of all classes had to be forwarded to the works from the drought-affected areas, and large numbers of light-weight carcasses was the natural result of the rushed killing operations.

For further comparison the following table showing the killings of sheep and lambs at meat-export slaughterhouses for four seasons, 1st October to 31st March, indicates the stock killed from the beginning of each season to the 31st March:—

Stock.	1942–43.	1943–44.	1944–45.	1945–46.
Sheep	1,910,150	1,937,477	1,894,985	2,594,571
Of which were—				
Ewes	1,436,995	1,499,798	1,349,074	1,967,187
Lambs	8,341,624	7,407,317	7,119,633	8,735,367

The following table shows the number of stock slaughtered under direct inspection during the year ended 31st March, 1946, at abattoirs and meat-export slaughterhouses:—

Class of Stock.	Abattoirs.	Meat-export Slaughterhouses.	Total Slaughterings under Inspection.
Cattle	167,508	507,440	674,948
Calves	39,049	941,660	980,709
Sheep	824,151	3,939,750	4,763,901
Lambs..	153,054	12,518,554	12,671,608
Swine	79,030	628,047	707,077

Slaughterings at rural slaughterhouses during the year were as follows: cattle, 61,769; calves, 1,021; sheep, 233,328; lambs, 23,041; swine, 8,306.

Of the animals shown in the table above as slaughtered at meat-export slaughterhouses, the following have gone into consumption within the Dominion: cattle, 51,388; calves, 20,779; sheep, 346,737; lambs, 190,927; swine, 200,448.

Compensation paid for Stock and Meat condemned

Compensation amounting to £13,974 12s. 6d. was paid out during the year for animals condemned in the field under the provisions of the Stock Act, and £22,289 5s. 9d. for carcasses or parts of carcasses condemned for disease on slaughter for human consumption at abattoirs, meat-export slaughterhouses, &c., under the provisions of the Meat Act.

Importation of Stock

The following stock were imported during the year: cattle, 11; sheep, 245; pigs, 6; horses, 15 (not including the movement of thoroughbreds between here and Australia). Of the above animals, the following were placed in quarantine for the respective periods required: cattle, 11; pigs, 6; sheep, 19.

Exportation of Stock

During the year under review the following animals were exported: cattle, 51; sheep, 384; pigs, 41; horses, 2. There was considerable movement of thoroughbred horses to and from Australia, shipping difficulties being the main problem.

Dairy Inspection

Dairy inspection has been maintained on all premises registered for supply of milk and cream. It is generally agreed that producers have had difficulty in maintaining premises in first-class condition or in carrying out any extensive alterations or additions to premises owing to scarcity of materials and difficulty in finding labour to do the work. All Inspectors are agreed that producers have endeavoured to supply a first-class product, but deterioration has sometimes taken place after the product leaves the farm. A big improvement in the keeping-quality of the milk in the Christchurch district resulted from a twice-daily collection instead of once daily. Quite naturally this tended to prevent any stale milk being mixed with fresh, which otherwise might have taken place.

Composite milk samples were collected from 210 herds representing 3,316 cows in the Otago district and forwarded to the Animal Research Station for the biological test for tuberculosis.

Many sediment tests were taken of samples from herds, and in cases where results were unsatisfactory, instructional visits were made to the farms and a general check-up was made of the production methods adopted. Special attention was paid to the human factor, the actual milk-production methods being scrutinized, particularly udder-washing, attention to utensils, cleaning of milking-machines, cooling of milk, &c.

In all cases where samples have been collected by Sanitary Inspectors of local authorities or by Inspectors of the Health Department the results of tests have been forwarded to the inspection staff. Where unsatisfactory results of tests have been found, the matter has been promptly followed through to the distributor and the producer.

In the Otago district 20 new premises have been built and 20 existing premises have been reconstructed during the year. In other districts some new sheds have been erected and many improvements carried out. Freezing units have been installed in a number of sheds in the Canterbury district.

The supply position has been a very difficult one during the year, particularly during the winter months and again during the drought period in the districts affected by the latter.

Many producers are loth to carry out any improvements to premises in order to be in a position to supply milk at times of scarcity. The period of supply is frequently a short one and the margin of return from town supply as against factory supply is considered to be small.

Poultry

The report of Mr. F. C. Bobby, Superintendent of Poultry Husbandry, is submitted herewith :—

With the termination of hostilities and a return to more normal conditions it is desirable to review briefly the war years in addition to recording events of the past year. In company with other primary producers, poultry-farmers experienced severe difficulties during the war years, with a resultant decline in egg-production. Supplies of eggs available are still insufficient to meet the heavy demands throughout the Dominion, and there is little possibility of this position improving until the industry can again expand with safety. The main limiting factors to any plans for increased production are the inadequate supplies of foods suitable to poultry and a lack of building-materials. Until these two deficiencies can be overcome, eggs are likely to remain in short supply, particularly during the winter period. The supply position was eased considerably during the war period by the importation of egg-pulp and dried-egg powder from Australia. Poultry-farmers have been encouraged to produce to the limit under existent conditions by the granting of a subsidy of 3d. per dozen on all eggs passing through recognized marketing channels. This subsidy has in turn resulted in attracting many eggs to egg floors, from which it has been possible to ensure a more equitable distribution of eggs available to the public. Approval has been granted for this subsidy to be continued until the end of May, 1947. This will assist to maintain organized marketing during the transition period from wartime conditions to those of peace. There is a keen desire among poultry-farmers that orderly marketing shall continue, and those responsible for leading the industry are studying closely post-war marketing plans and the future effective organization of the poultry industry. Appreciable advancement in both marketing and organization has been achieved during the war years.

The demand upon the services of Poultry Instructors continues to be heavy, and the Department has been approached by the industry on several occasions to increase the number of officers available for poultry instructional work. The instructional staff has been increased to 12 officers, stationed at the following centres: Auckland, 3; Palmerston North, 2; Hastings, 1; Wellington, 2; Christchurch, 2; and Dunedin, 2.

There is every indication that poultry-farmers are making increased use of the service offered by the Department, and it is doubtful whether the present field staff will be able to deal effectively with the work offering.

Improvement of Stock.—The past year saw the establishment of the New Zealand Poultry Flock Improvement Plan. This new scheme, sponsored by the industry and administered by the Department, aims at improving the constitution, health, and type of breeding-birds used in the Dominion. Flocks which measure up to certain desirable standards are accredited under this plan. A list of accredited flocks is published and will assist those wishing to purchase hatching eggs, chicks, or adult birds from a reliable source. Twenty-eight flocks were accredited in June, 1945, and it is hoped that over double this number will be listed for 1946. Steady, rather than spectacular, developments in this plan are anticipated.

Poultry Diseases.—Unfortunately there has been no decrease in outbreaks of poultry diseases. The control of disease will be one of the major problems in post-war work by the Department. Steps are being taken in New Zealand and overseas to secure the services of a veterinary officer who has specialized knowledge of poultry diseases. A real need is felt for an extension officer for work in the field and increased research work at the Animal Research Station, Wallaceville.

A marked advance has been made during the war years in the control of pullorum disease of young chickens (*Salmonella pullorum*). This disease is transmitted to the young chicken from the hen through the hatching egg. Fortunately, by means of a blood agglutination test carried out on the farm it is possible to detect the "carrier" hens. Such reactors to the test can then be removed from the breeding-stock. Approximately 700 birds were tested in 1941, while the number recorded for 1945 is nearly 110,000 birds. This has thrown heavy additional work on to the Poultry Instructors, who are to be commended upon the way in which they have carried out this steadily increasing volume of work during the last four years. It is envisaged that at least two new officers, appointed as Blood-testing Officers, will be required to assist with this essential work during next year.

Rehabilitation of Returned Servicemen.—Considerable interest is being shown by returned servicemen in the future possibilities of poultry-farming as a livelihood. Care is being exercised to see that only suitable applicants enter the industry, and a minimum training period of one year is insisted upon. Poultry Instructors have given useful service in this direction by finding good farms for trainees and by offering practical advice upon the purchasing of suitable properties when these men have been trained. A number of trainees have been placed at the Poultry Station, Wallaceville, and the table-poultry plant, Upper Hutt, with satisfactory results for the returned servicemen concerned.

Table-poultry Production.—Increased attention has been focused upon table-poultry production during the war years, due largely to the demands of the American Forces in the Pacific area and an increased demand in New Zealand following meat rationing. The United States Joint Purchasing Board called for a high-grade chicken processed in a manner similar to chickens in the United States of America. The effect of meeting their requirements has had some beneficial reaction upon table-poultry production in the Dominion and resulted in certain firms maintaining a better standard of killing and processing, although the American demand has ceased. This will ultimately benefit both the consumer and poultry-producers.

At the request of the American authorities the Department established a table-poultry-producing plant at Upper Hutt in 1944 for the production of chickens for the United States Joint Purchasing Board. Although serious difficulties in rearing were encountered in the early stages, and despite the necessity for severely curtailing production at a later date due to a shortage of poultry-foods, approximately 30,000 birds were processed and passed to the United States Joint Purchasing Board.

Having served its original purpose of producing chickens for the United States Joint Purchasing Board, it is considered that this plant could be reorganized for demonstration, educational, and research purposes and so be of considerable value to the poultry industry. Approval to adopt this course on a permanent basis is being sought, and it is envisaged that the stock from the Poultry Station, Wallaceville, will be transferred to this new property. The latter offers full facilities for a demonstration table unit, a pedigree stud flock, and a general laying flock for use in practical feeding and management experiments. There is also sufficient housing for the establishment of laying trials at which stock sent in by poultry-breeders could be tested for egg-production.

Educational Work.—Of necessity, this has been somewhat restricted during the war years, largely because poultry-farmers have found it difficult to travel to meetings. Poultry publications of educational value have also been limited during the war period owing to paper shortages, but a start has been made to rectify this position by the publication of three new bulletins dealing in detail with different aspects of poultry husbandry.

At the instigation of the Department, Massey and Lincoln Agricultural Colleges received grants of money for an extension of their activities in poultry husbandry, with the short-term policy of increased egg-production and a post-war policy of providing a centre in each Island for training poultry students. Massey Agricultural College made extensive additions to their existing plant, while Lincoln established an entirely new plant for 2,000 laying birds.

In concluding this report it is gratifying to record that, in spite of the many difficulties occasioned by a prolonged period of war, the poultry industry has made progress. The Department has been able to assist in this progress with an expansion of the services offered to poultry-farmers, a service which is both necessary and appreciated by those concerned.

Wool

The report of Mr. J. P. E. Duncan, Wool Supervisor, is submitted herewith: —

During the last twelve months the work of this section has returned almost to the pre-war scope. Certain differences are still in evidence, however—*e.g.*, the appraisal scheme is still in operation, which lays down fixed types and prices for wool and makes instructional work on wool-classing considerably simpler. Lecturing activities still include work for the Army Educational and Welfare Service and young farmers' clubs. Lectures are always accompanied by a visual aid—either film, film strip, lantern slides, or a practical demonstration on wool.

A number of instructional articles have been published in the *New Zealand Journal of Agriculture*, and two new bulletins have been published on "Spinning" and "The Power Spray Method of Dipping Sheep." Requests for plans of wool-sheds, yards, and dips have received attention, and additional plans for sheep-yards of special design have been prepared and yards built at Ruakura and Manutuke Animal Research Stations. The usual reports on wool samples submitted by farmers and others have been sent out.

A number of new projects have been initiated during the year. A survey of all the wool-scouring works in the Dominion has been completed to ascertain the present capacity of the industry, the types of machinery and equipment available, and general efficiency or otherwise of the work being done. Some work has been undertaken for the Marketing Department in checking up on conditions of wool storage and dealing with deterioration due to insect damage. At Ruakura the new power-spray dip was thoroughly tested during the dipping season and has given every satisfaction. In addition, small-scale trials with new potential dipping-materials such as "D.D.T." and "666" have been commenced in collaboration with the Animal Research Division, and results to hand are promising.

During the last session the necessary amendments were made to the Stock Act to render all wool-marking preparations subject to test and Ministerial approval prior to sale and use. All the branding-materials on the market at the present time, including raddles, marking-pencils, and branding-fluids, have now been tested for scourability. The results show that all the raddles and marking-pencils can readily be removed by standard scouring methods, but that the majority of marking-fluids (branding-oils) are more or less resistant to scouring. There is one outstanding exception, however, one of the imported marking-fluids being quite easy to scour out. The satisfactory products have been given Ministerial approval for sale and use, which must in future

be shown on a label attached to the container, and in order not to create undue hardship on account of stocks on hand the products which would not scour out have been given limited approval for a period of twelve months. In addition, it has been made an offence to use any substance other than an approved wool-marking preparation for wool-branding, or to mix with or add to an approved preparation any substance other than a clear volatile solvent that has no injurious effect on wool. It is hoped that within the next two or three seasons the position in regard to the use of deleterious wool-marking substances should be greatly improved. New Zealand is the first country in the world to take legislative action to restrict the sale and use of harmful preparations.

Another project which is being considered is the establishment of a testing-house for wool in New Zealand primarily for the determination of wool yields, but which can later be extended to cover other factors such as moisture content of scoured wool, percentage of seed, contamination of wool, &c. A service to give rapidly the yields of greasy-wool samples would be of considerable assistance to the wool-appraisers and later, with the return of the auction system, the wool-buyers. Testing-houses have long been in operation in Great Britain and on the Continent, and three such units have recently been successfully established in Australia.

During the year a number of other activities have been undertaken, including the taking of topical photographs of sheep-farming operations to be used later for illustration purposes or for slides and/or film strip. Some work has been done in helping to perfect the tools used for meat-marking under the present meat-grading scheme, and a new projector to handle standard lantern slides, miniature lantern slides, or film strips has proved an advance on the old system. There has been close co-operation with the Secretary of the New Zealand Wool Board on several projects.

Present indications are that the wool-clip for the 1945–46 season will not be as attractive as last year, nor will the quantity of wool produced be as great as that grown last year, which was a record for New Zealand. Reasons for this are apparent when we realize that seasonal conditions, good or bad, are always reflected in the growth of wool. Climatic conditions in the South Island during the winter months of 1945 have been exceedingly bad. Canterbury, Otago, and Southland experienced one of the worst winters for many years, with the inevitable result that the wool-clip suffered. The most noticeable feature about the clip was its lack of colour, style, and length of staple. Cotted fleeces were fairly common, and in some districts tender wools were prevalent.

The North Island has also suffered from adverse weather conditions. The drought conditions in the North Auckland, Hawke's Bay, and Poverty Bay Provinces from September, 1945, until the present time have also had a bad effect on the wool, which has been light in condition—*i.e.*, grease content—deficient in length, and inclined to tippiness, with numerous cotted fleeces in the clips. Tick stain is still bad in some districts, but the position is improving as Derris again becomes available in dips. Water stain has been noticeable on bellies and pieces from Auckland, southern Hawke's Bay, and Wanganui.

Although no figures are yet available for the 1945–46 season, the following provides a brief comparison of quantities and prices over the last four years :—

Season.	Number of Bales sold.	Net Weight.	Gross Value.	Average per Bale.	Average per Pound.
		lb.	£	£ s. d.	d.
1941–42	985,350	335,949,068	18,172,748	18 8 10	12·98
1942–43	950,607	327,321,380	19,916,828	20 19 0	14·60
1943–44	930,694	316,152,540	19,424,253	20 17 5	14·74
1944–45	1,038,019	357,606,520	22,013,258	21 4 1	14·77

The Government Statistician gives the estimated greasy-wool production for 1944–45 as 372,000,000 lb., a record.

Rabbit Nuisance

During the year under review there has been no noticeable decrease in the rabbit population ; in fact, in certain districts, particularly outside Rabbit Board control, an increase has been observed. The season was generally favourable to breeding, whereas, on the other hand, conditions experienced in a number of districts precluded satisfactory "kills" from poisoning. Strychnine, which is the principal killing agent employed, was in short supply during the early part of the main poisoning season, due to import difficulties, and this aspect, combined with a general shortage of suitable labour, affected the overall position.

A total of 101 Rabbit Boards have now been established under the Rabbit Nuisance Act, 1928, compared with 74 as at the 31st March, 1941. This is a very substantial increase in spite of the handicap of war conditions, and is further satisfactory evidence that Board control is being recognized and accepted as the best means of controlling and eventually

eradicating the rabbit pest. Further Boards are in process of formation, and if this trend is continued there should eventually be a marked decrease in the pest. With very few exceptions Boards have adopted what is known as the "killer" policy, and this system of operation has proved to be most effective and is now regarded by all concerned and interested in the destruction of the pest as yielding the best results. Boards have continued to do good work even under the handicap of shortage of suitable labour, strychnine, rabbit-traps, &c. Subsidies paid to Boards on rates collected during the year amounted to £54,615, compared with £29,705 in 1941, which is striking evidence of the support given to Boards by the Government in their work of rabbit-destruction.

The Rabbit-skins Levy Committee in Dunedin has continued to operate, and it is clear that the payment of a subsidy on milky does and small unmarketable skins has been of material assistance in keeping in check the rabbit population, as the subsidy has encouraged the destruction of rabbits during the spring and summer months, when normally they would not be destroyed.

It is apparent that the high prices ruling for skins are still retarding the work of extermination, and until this problem is solved—possibly by the extension of Rabbit Boards—little progress will be made in a large number of districts outside of Board control in eradicating the pest. Rabbit-skins exported last year totalled 17,670,078, which gives some indication of the extent of the pest.

With the cessation of hostilities resulting in a greater volume of labour becoming available, and ample supplies of strychnine now on hand, there is no reason why a greater and more sustained effort should not be made in eliminating the rabbit pest.

Noxious Weeds

The Department has continued to give financial assistance to local authorities for noxious-weeds work, particularly ragwort, and, having regard to the shortage of labour and the difficulty encountered in obtaining adequate supplies of Atlacide and sodium chlorate, quite effective work has been carried out during the year. Beyond the efforts of County Councils in controlling the spread of ragwort, there is no appreciable reduction in other classes of noxious weeds—blackberry, gorse, variegated and Californian thistle, &c.—on farming-lands, and here again effective work has obviously been retarded by the scarcity of labour and suitable weedicides. With an improvement in the supply position, however, a greater concentration of effort in dealing with the noxious-weeds problem may be expected—in fact, is necessary—if our primary production is to be maintained. Thirty-two counties have now taken over the administration of the Act, but they are also confronted with the shortages referred to earlier.

Weeds on unoccupied Crown and Native lands have been kept under control.

During the year a special Noxious Weeds Committee was set up by the Hon. Minister of Agriculture to study the position generally and to bring forward recommendations as to ways and means of more effectively dealing with noxious weeds in the future. The Committee consists of representatives of interested State Departments, Federated Farmers, and the New Zealand Counties Association, and a report is expected to be forthcoming shortly after a further meeting scheduled to be held in July, 1946.

ANIMAL RESEARCH DIVISION

REPORT OF J. F. FILMER, DIRECTOR

The conclusion of the war has made it possible to make plans for the development of the animal-research work of the Department on a permanent basis. Good progress has been made in providing facilities for handling farm animals under the carefully controlled conditions required for research. Laboratory facilities are still inadequate, but these will be provided as soon as the general building situation permits. There is, however, a critical shortage of University graduates of research calibre with an interest in the problems of domesticated animals. This factor, more than any other, is likely to limit the rate of progress in the future.

During the year Dr. C. S. M. Hopkirk terminated his long and distinguished career at Wallaceville when he left to take up an appointment with UNRRA. He has been replaced as Superintendent by Dr. I. J. Cunningham.

Diagnostic Services

The Diagnostic Station at Wallaceville has continued to render valuable services. The following samples were examined during the year:—

Milk samples	1,329*
Blood samples	2,797
Specimens—	
Cattle	451
Sheep	911
Pigs	61
Poultry	2,065
Horses	350
Miscellaneous	116
Total	8,020

* Two hundred and thirty for tuberculosis, of which 5 were positive.

Blackleg and "scabby mouth" vaccines were again prepared, and the number of doses issued free were:—

Blackleg vaccine—	
Cattle doses (1 ml.)	70,050
Sheep doses (2 ml.)	26,800
"Scabby mouth" vaccine: Doses	112,409

Research Work

Facial Eczema.—A large part of the North Island experienced an unusually dry summer and grave fears were expressed that a serious outbreak of facial eczema would occur. When the autumn rains fell, however, there was a marked fall in temperature and rapid pasture growth did not occur. Under these conditions only very few cases of the disease were observed.

The Department's experimental farm at Manutuke has been subdivided into small experimental paddocks, and suitable buildings and yards have been erected. It is now well equipped for the field investigation of facial eczema.

Millet Photosensitivity.—With the object of providing safe grazing for his sheep during the autumn period when facial eczema is likely to occur on pasture, one pastoralist in the Gisborne district decided to sow an area of millet. As Japanese-millet seed could not be obtained, he sowed broom-corn millet (*Panicum miliaceum*), which is imported from Australia for use as bird-seed. Some 500 lambs were grazed on this area. After four days 120 were noticed to be showing swelling of ears, face, and eyelids characteristic of facial eczema. Eventually over 80 died. The affected lambs all showed acute jaundice. The millet remained toxic for three months and was still toxic after it had seeded.

The condition caused by broom-corn millet is very similar in many respects to facial eczema, but is probably not identical with it. Chemical investigations are proceeding with a view to determining the toxic principle.

Japanese millet (*Echinochloa crus galli* var. *frumentacea*) has been grown twice at Manutuke and grazed with sheep, which have remained quite healthy. It is therefore of considerable importance that farmers who consider sowing millet for grazing should make sure that they obtain seed of Japanese millet and not that of broom-corn millet.

Genetic Photosensitization of Southdowns.—Further breeding experiments have now shown conclusively that this condition is inherited as a simple Mendelian recessive.

Studies of the liver dysfunction are being pursued. There is no anatomical abnormality that can be demonstrated by macroscopic or microscopic examination or in vascular casts. Excretion of pigments such as phylloerythrin and rose bengale is imperfectly accomplished. A variety of liver-function tests is now being applied to affected animals.

St. John's Wort Photosensitization.—Hypericum perforatum (St. John's wort) is established on a considerable area of country in Marlborough, MacKenzie country, and Central Otago. Consumption of this plant causes photosensitization, and it has also been observed in New Zealand that photosensitive sheep go into convulsions when their skin comes into contact with water, as in crossing a stream or when dipped. Experiments have shown that the convulsions occur only when active photosensitization is present, since black sheep fed St. John's wort and kept in the sun or white sheep fed similarly and kept indoors are not sensitive in the dip, whereas white sheep fed St. John's wort and kept in the sun until photosensitive do take fits when dipped.

Cattle are also similarly susceptible, a reaction being observed when they wade rivers and streams.

The problem is of considerable significance in the affected districts, as dipping becomes hazardous to the sheep. Control of the weed is the only feasible method of reducing its dangers, and any methods except biological ones are impracticable because of the rough country. The Cawthron Institute has undertaken an examination of biological methods and some success is reported from the use of insects imported from Australia.

Sheep Nutrition, Canterbury.—The investigation of the nutrition of ewes, lambs, and hoggets under Canterbury conditions was continued at the Kirwee Experimental Farm and further valuable results have been obtained. Shortage of staff has made it necessary for the Department to relinquish this work, which in future will be continued by the Canterbury Agricultural College with financial assistance from the Department.

Rickets in Sheep.—The investigations at Kirwee were continued. It was shown that green barley as well as green oats will produce rickets in hoggets during winter. Single massive doses of vitamin D in the form of Calciferol prevented the disease and also increased the growth rate. Rickets did not occur in Italian rye-grass, turnips, or chou moellier.

Bowie.—The work of the previous three seasons directed toward the prevention of this disease in Marlborough was continued during the 1945–46 season. Using a compound mineral lick containing all minerals known or thought likely to be essential to animal health in the concentration in which they are present in normal pasture, bowie was virtually prevented on a paddock where its incidence had been high during the previous three seasons. In addition to being practically free from bowie, the lambs of ewes receiving this lick throughout pregnancy were of a particularly high standard for the country they were bred on and were considered to be the best crop of lambs to be bred on the property.

During the 1945–46 season the incidence of bowie in a similar paddock (but one in which its incidence tends to be lower) was fairly high (approximately 10 per cent. severe and 10 per cent. mild cases), this suggesting that the absence of bowie in the treated sheep was probably not the result of more favourable climatic conditions.

SHEEP-BREEDING

Progeny-tested Romneys.—In the nucleus flock the lamb percentage was good, 223 lambs being tailed from 214 ewes mated, in spite of the fact that some 20 of the older ewes died prior to lambing.

Nine rams were progeny-tested during the year by paddock mating each with 50 flock ewes. To maintain an even, early spread of lambing, they were each given three and a half weeks' service, the ewes thereafter being boxed and run with Southdown rams. Lambing was fair, and sufficient lambs (15–42) were obtained from all fertile rams to permit a reasonable progeny test. One ram proved infertile. The rams so tested were purchased from four different breeders.

The cold dry spring and early drought retarded growth of lambs, as evidenced by the fact that of 400 Romney wether lambs only 80 could be sent for slaughter in January. Subsequently all lambs lost condition as the drought continued. Evaluation of carcass conformation had to be abandoned in consequence. Relevant data on birth weights, docking and weaning weights, fleece weight, count, and character were obtained. Comparison of the progeny on a sire group basis showed that there was no outstanding ram among the nine tested. Two rams were slightly above average in most characters, but not sufficiently so to make their more extensive use worth while. This result is disappointing; of the 20 rams so far tested—all stud rams from prominent breeders and ranging in price from 30 to 130 guineas—no worth-while individual has been located.

During the present season 8 two-tooth rams and 7 ram lambs of our own breeding have been mated for testing. Ram lambs this year have worked successfully.

Inheritance of "Count."—A three-year experiment to test the theory that "count" of wool in the Romney is a strongly inherited character has been designed. The first year's work has been on a small scale with two groups of 30 strong and fine woolled ewes respectively. The strong group included no animal with wool finer than 44's, and the fine group no ewes stronger than 50's. Half of each group were mated with a "strong"-woolled ram (40's) and half with a fine-woolled ram (48/50's). Results so far are extremely preliminary and available only on a basis of count of lamb's fleece, which, of course, cannot be compared yet with that of the ewe fleece.

Inheritance of Carcass Conformation.—Results for two years of an experiment designed to test the theory that carcass conformation in the sheep is weakly inherited are now available. The method was to select two groups of extreme-type ewes—good and poor conformation—from a large ewe population and to mate these to the same Southdown ram or rams. All the progeny were fattened as lambs and measured for carcass quality on the hooks. Measurements of width of gigots, depth of crutch, and leg length, while slightly in favour of the lambs from the better-type ewes, are too small for significance. Only in respect to length of cannon bone are the differences sufficiently large to be considered significant.

Over the two years a small number of the same ewes produced lambs (20 pairs). Comparison of these two groups of progeny shows the differences to be of slightly greater magnitude and to be statistically significant in each year in respect of the major characters. At the same time, the differences are such that the general theory that carcass conformation is so weakly inherited as not to be worth while considering in selection work may be taken as having been substantiated, though this result should be regarded as tentative until the data from similar work within Romneys alone come to hand.

Relationship of Strength of Wool to Quality of Carcass.—Inquiries from several stud breeders as to whether breeding for strong or fine wool in the Romney would affect adversely the quality of the carcass suggested that it would be worth while obtaining some factual information on the subject.

Two extreme groups of 100 ewes were selected from approximately 1,000 ewes on a basis of the wool count. The strong-woolled group were all stronger than 46's (40's–46's) and the fine-woolled group all finer than 48's (50's–54's). The ewes were

tupped with 6 Southdown rams and grazed together from the commencement of tupping until the lambs were removed for slaughter. Lambs were picked as "fats" in the normal manner, slaughtered, and relevant carcass measurements to assess quality accurately were obtained.

Results indicate that the type of fleece of the ewe, in so far as wool count is concerned, has no effect upon the carcass quality of the fat lamb. It is therefore unlikely that breeding for either strong or fine wool within the Romney breed would adversely affect the use of cast-for-age Romney ewes for fat-lamb production.

The Effect of Non-castration on the Quality of Southdown × Romney Fat Lambs.—This project has been completed, and the results over the past two seasons may be summarized as follows:—

(*a*) The carcass quality of 280 entire (ram) lambs, 255 castrate (wether) lambs, and 286 (ewe) lambs, comparably bred and reared, has been determined by detailed carcass measurements.

(*b*) In each season ram lambs have produced heavier carcasses than wethers and wethers heavier carcasses than ewes under the same conditions.

(*c*) This superiority in weight was less in the poor season of 1945–46 than in the good season of 1944–45.

(*d*) Non-castration increased bone size and muscle and reduced fat as compared with castration. Rams were wider in gigots, but longer legged and deeper in crutch, and thus were inferior in conformation to wether lambs.

(*e*) Ram lambs graded slightly poorer than wether lambs under existing grading standards. Under standards calling for a more meaty carcass this situation would be reversed.

(*f*) Despite the poorer grading, the extra weight enabled the ram lambs to command a premium over the wether lambs.

Influence of Breed of Ram on Carcass Quality of Fat Lambs.—Though the pre-eminence of the Southdown breed as a sire of fat lambs has been firmly established in New Zealand, a number of other fat-lamb ram breeds is also used by a proportion of farmers. Some of these are relative newcomers in the field. Experiments have been designed to compare the relative merits as fat-lamb sires over the Romney ewe of the following breeds: Romney, Southdown, Ryeland, Dorset Horn, English Leicester, Border Leicester, Suffolk, and Cheviot. Rams of these breeds have been paddock-mated during the present tupping season with even groups of 60 ewes. From tupping all ewes will be run together until lambs go away fat. Lambs will be individually measured on the hooks. The experiment will be continued for three seasons to measure any seasonal effects and to obtain adequate numbers. The work will parallel investigations that have been carried out by the same workers in the South Island for typical breeds and crosses of that area and will provide factual information on a subject upon which only opinions can be offered at present.

Dairy Cattle Research

Mastitis.—The milking season, 1945–46, was utilized to carry out a bacteriological survey of milking-herds in the North Island as a preliminary to instituting a mastitis-control scheme on an experimental basis. Milk samples from approximately 2,500 cows were examined from herds chosen at random in the Hutt Valley, Wairarapa, Manawatu, Taranaki, Hawke's Bay, and Waikato areas.

A limited amount of work was done in connection with treatment of mastitis. Studies on normal cows showed that udder infusions of sulphonamide-in-oil preparations had the least depressant action, while infusion with acriflavine caused considerable reduction in yield for a few days. Promising results were obtained by collaborators in the field from treating clinical cases with sulphanilamide by mouth and by infusion of acriflavine emulsions. Supplies of penicillin have now been obtained and its value in treatment of mastitis will be thoroughly studied.

With a view to treatment of staphylococcal mastitis, the sulphathiazole resistance of a large number of staphylococci was determined and some experiments were instituted in an endeavour to obtain the required concentration in milk by oral administration of the drug. Though a greater concentration of the drug appeared in the secretion from clinically affected quarters than from normal quarters, the dosage scale required was too expensive to merit further investigation at present. Studies will be made of treatment of suitable cases by udder infusion with emulsions of sulphathiazole and of sulphadiazine and by the use of staphylococcal toxoid.

Experiments were begun to determine a quick and reliable method for demonstrating *Str. agalactiæ* in milk samples.

Studies of Milking Methods.—The "milk-flow recorder" apparatus has been used during the season to investigate several aspects of the milking process.

Under carefully controlled standard milking conditions the characteristics of the milk-ejection curve have been measured and described. Twelve cows with very variable reputations as milkers and of variable productive efficiency were employed. The following generalizations have been made: average milk flow tends to decline toward the end of the season, so that the time taken to milk does not decrease; machine strippings do not increase with lactation in actual amounts, but do so on a percentage basis, since total yield drops; starting-time tends to increase and become erratic toward end of lactation, the average time taken for milk to be "let down" being 0·79 minute and average milking-time 4·37 minutes. This latter is much shorter than that measured in the field—8·3 minutes—suggesting that there is a tendency for cups to be left on longer than necessary. To obviate this, a new type of "sight glass" for determining when milk flow has ceased has been designed.

The influence of the pulsator and of variations thereto have been measured. Results showed that under otherwise normal milking conditions the application of a greatly reduced pulsator stimulus had no effect upon milking rate. It was also shown that once milk flow starts with pulsator operating, cows will continue to milk if the pulsator is stopped: that normal milk let down is not obtained if an attempt is made to commence milking without the use of the pulsator.

The rate of application of the "squeeze" and the "release" by the pulsator has likewise been shown to have no effect on milking rate. Pulsator speeds of 21, 42, and 84 pulsations per minute at normal vacuum, and vacuum levels of 10 in., $14\frac{3}{4}$ in., and 19 in. at normal pulsator rate of 42 per minute, did not produce significant differences in milking rate. These experiments are of special interest in view of the emphasis often placed on the importance of correct pulsation.

Apparatus for measuring intra-mammary pressure—of importance in relation to the letting-down of milk, non-stripping, and mastitis—is in process of development. The hormone aspects of the milk let-down process have been the subject of preliminary studies.

A survey of Northland herds using non-stripping has been made to add to our information on the machine-milking methods and equipment being used successfully for this purpose.

In co-operation with the New Zealand Dairy Board herd-recording department, a detailed examination of the performance of milking-machines in relation to mastitis in 18 herds over three years has been completed. It was found that, based on the incidence of clinical quarters, there was no difference in the incidence of mastitis in herds where milking-machines and conditions of use were classified as "good" as compared with herds where the classification was "average or poor." The performance of the machine was classified after taking into consideration pulsator ratio and performance, operation of relief-valve, condition of inflations, the claw, air-hole clearance, speed of milking, and the pump efficiency.

Artificial Insemination. After the disappointing results of last year it is pleasing to report a much more satisfactory situation as a result of the past season's work. Following

the low conception rates of 1944–45, a pilot experiment involving 272 cows was organized in town-supply winter-milking herds handy to Ruakura. Approximately equal numbers were inseminated by the uterine and by the cervical technique. The same semen was used to an equal extent for both systems, and all other conditions were standardized. Results were equal to natural mating and are as follows: cervical, 104 conceptions from 173 inseminations (60·1 per cent.); uterine, 95 conceptions from 153 inseminations (62·0 per cent.).

There was no difference in conception rate for semen used at three different ages—0–4 hours, 16–20 hours, 24–28 hours. The good results obtained by the cervical system are well above expectation and might be due to the short heat periods which appeared to be typical in winter, resulting in ovulation being more closely related to heat than in spring- and summer-breeding cows.

During spring the main experimental group of 1,302 cows in 18 herds was handled in the same way. Farmers were asked to provide their whole herds for a minimum period of one month. Many carried on for a longer time and some for the whole mating period. In the first six weeks 1,462 inseminations were given and 71 per cent. of cows mated were in calf after this period. During the first month both methods were used to an equal degree, and at the end of this time the following results had been obtained: cervical, 270 conceptions out of 577 inseminations (46·9 per cent); uterine, 383 conceptions out of 604 inseminations (63·5 per cent.).

The work was done with a team of 5 proven sires working on a five-day collection rota, supported by a team of 5 yearling sons of proven sires from Lifetime Merit Register cows. These latter were mated with sufficient cows in the group to give a progeny test in due course and is one of the methods adopted to ensure a supply of proven sires for such work. The value of different methods of laboratory examination of semen for estimating fertility of a bull will be investigated from the data obtained.

The season's work has shown that results comparable with natural mating are possible with the uterine technique, but that the cervical technique gives results that are not good enough for commercial use. Its efficiency might be improved by increasing the dose, but this would defeat the main purpose of artificial insemination of increasing the use of a proven sire. In fact, a higher dilution than that used at present is necessary if artificial insemination is to be extensively employed in New Zealand.

The added experience of the year leads us to the opinion that two factors—(*a*) the short breeding season, and (*b*) the extreme shortage of proven sires of high fertility, together with the probable need to use the uterine technique—make it likely that previously held ideas of herd improvement through artificial insemination on a national scale will have to undergo considerable modification. In particular, it is felt that these limitations mean that the system might contribute more effectively to the efficiency of the national herd by its use with pedigree rather than with grade cattle. Such use would be more practicable in terms of available bulls, numbers of cows, and technique, and would aim at lifting herd efficiency by providing large numbers of sons of proven sires for use in commercial herds by natural mating. Under the first scheme a proven sire would mate with 600 cows during his artificial insemination life, contributing thereby approximately 250 daughters to the industry. The same bull under the second scheme would leave 150 selected sons, which, mated each with 90 cows during a three-year life, would contribute 6,000 granddaughters to the industry. It might be re-emphasized here that, contrary to the position in overseas countries, our interest in artificial insemination is solely as a herd-improvement measure, and not as a method of replacing the bull on the farm.

Next season's work envisages an attempt to increase the coverage per bull by increasing dilution rate, using again a winter "pilot" experiment and a spring "main" experiment, together with an attempt to investigate the possibilities of extending the method on pedigree cows of the Waikato. For the latter the co-operation of the stud breeder is essential.

Bull Sterility.—The sterility service for bulls was maintained during the season. Similar use was made of it as in previous years. The proportion of sterile and infertile bulls coming up for examination as a means of checking fertility before use, or of determining whether the bull has been responsible for poor conception results in herds experiencing trouble, has been much the same as in previous years.

Five sets of identical twin bulls reached the yearling stage during the year and have been the subject of examination of their reproductive behaviour to determine whether they will provide the material needed to measure the effects of various factors such as exercise, nutrition, and management upon bull-fertility levels. Semen from each pair was collected over a normal breeding season and subjected to a series of laboratory tests. Final analysis of the data is incomplete, but the indications are that such bulls will be so many times more useful for direct experiments of the type mentioned than non-twin bulls that such experiments will now become feasible. The first experiment planned will attempt to measure the influence of feeding upon semen quality and quantity.

Cow Sterility.—The systematic examination of empty cows made available from the artificial insemination herds has been continued. Numbers are as yet insufficient to provide a reliable estimate of the relative incidence of different types of female sterility in our cattle, but, in general terms, previous indications as to the fairly high incidence of ovarian abnormalities have been confirmed. A large proportion of cases are still found for which no definite cause can be given. Arrangements have been made with the English authorities to obtain cultures of *Trichomonas* as an aid to diagnosing effectively this disease and thereby determining its importance in New Zealand.

Work on the pathology of the pituitary gland in relation to the abnormal ovary has been continued.

Contagious Abortion.—Results which have been collected from farms where vaccination has been carried out provide further evidence that inoculation of heifer calves with a vaccine prepared from *Br. abortus*, strain 19, confers a high degree of immunity against contagious abortion. In 1945 returns were available from 1,266 herds for 16,075 two-year-old heifers vaccinated as calves. There were 2·6 per cent. of abortions from all causes among these heifers, whereas in the previous year there were 22·3 per cent. of abortions in 17,098 unvaccinated heifers in the same herds. Examination of post-calving blood samples from 155 aborting vaccinated heifers showed that 69 gave negative reactions and therefore presumably aborted from causes other than contagious abortion. Results were also available in 1945 for 6,537 second pregnancies of animals vaccinated as calves; 2·8 per cent. abortions occurred, but only a little more than half of these was due to contagious abortion.

The demand for vaccine is still growing. For the 1945 season, 110,000 doses were prepared at Wallaceville, and it is anticipated that 150,000 doses will be required for the 1946 season. Arrangements were made to have the 1946 season's requirements prepared at the Commonwealth Serum Laboratories, Melbourne, Australia.

Following Australian reports that high post-vaccination titres result from tail inoculation of smaller volumes of vaccine, an experiment has been commenced in New Zealand.

One hundred and fifty calves have been divided into three groups. One group has been vaccinated with 5 c.c. of strain 19 subcutaneously, the second group with 1 c.c. of strain 19 intra-caudally, and the third group kept unvaccinated as a control. The calves will be reared, mated, and when three to four months in-calf will all be infected artificially with the abortion organism to determine relative immunity obtained from the two types of vaccination.

Attempts are being made to develop a laboratory test, dependent on the differential bactericidal effect of sera from vaccinated and normal animals on suspensions of *Br. abortus*, which will be of value in determining the comparative efficiency of different types of *Br. abortus* vaccines or different methods of administration.

Inheritable Red Blood-cell Characters in Cattle.—Investigations have been continued on the production of reagents to detect the thirty-odd red cell characters of cattle.

Transfusions of whole cattle blood, of washed red cells, and of red cell stromata have been made into cattle, rabbits, and sheep in efforts to produce specific reagents. Reagents for two previously unidentified red cell antigens have recently been obtained.

The method of determination of red cell antigens has proved to be a critical test for the detection of identical twins.

Much work yet remains to be done on the production of monospecific reagents before a study can be made of possible correlations between different combinations of characters and characters associated with production.

Pregnancy Diagnosis in Cattle.—Work on this project has had to be suspended owing to the resignations of all members of the team involved. Preliminary investigations have emphasized mainly the difficulties of the task. Much necessary preliminary work has been accomplished which will save considerable time when staff is again available to take up the study.

Dairy-cattle Breeding

Use of Proven Sires.—The location of proven sires and artificial insemination at Ruakura has permitted a start to be made with a long-term investigation of the use of proven sires, irrespective of blood lines, as a method of breeding dairy cattle. During the past two seasons all available cows have been mated to proven sires, or sons of proven sires out of Lifetime Merit Register dams. To date the following females have been bred. It is of interest to note that most of these are the result of artificial matings :—

——	Calves.	Yearlings.	Total.
By proven sires	69	41	110
By sons of proven sires	1	12	13
Totals	70	53	123

The first crop of daughters of proven sires will calve during the coming season. These animals are themselves in calf to proven sires or their sons, so that the second generation of this type of breeding will be available by the spring.

Inheritance of Defects.—Three possible cases of inherited defects in cattle have come to our notice and are being followed up : " hydrops calf " in Ayrshire cattle, blindness in Jersey cattle, and " blind forequarters " in Jersey cattle.

Induction of Twinning in Cattle.—Following the successful induction of twinning by the use of pregnant mare serum last year, when 12 cull cows were treated and the results determined through slaughter, some 25 head of Aberdeen Angus breeding-cows have been injected for twins this season. From the experience gained it would appear that, even if successful, the technique at present necessary is too difficult for practical use, except in herds where very careful control of stock is possible. The cows treated will be calving next spring.

Identical Twins.—Good co-operation was obtained from farmers in the location and collection of identical twins. The present twin population of the Station is as follows :—

Age.	Number of Sets.		
	Heifers.	Bulls.	Total.
Two years and over	3	..	3
Rising two years	13	5	18
Rising yearling	29	5	34
Calves	1	..	1
Totals	46	10	56

Partly to determine the usefulness of twins for experimental purposes, and partly to measure the heritability of various characters, the variability of the twins when reared under the same environmental conditions is being measured for all characters likely to be of importance in cattle work.

To this end changes in weight and body measurements are being noted at frequent intervals; colour pattern, whorls, hair colour, escutcheon shape, and other external characters are being recorded; physiological measurements, such as rate of respiration, body temperature, red cell count, red cell volume, hæmoglobin content, red cell size, blood mineral, and sugar and ketone status, are being made. Very promising results are being obtained, but conclusions must await full statistical analysis. During the coming season as much data as possible on milk secretion will be similarly collected and analysed. In particular, it is aimed to measure milk yield, milk composition and fat yield, rate of milking, ease of milking, milk ejection curve, stripping, length of lactation, and shape of lactation curve as data of major interest in production experiments. Reproductive data on female twins have also been accumulated.

A pair of thirteen-year-old Shorthorn cross identical twin cows has been slaughtered and measurements of all internal organs recorded. The carcasses are being held in cold store for dissection and examination of the muscle, bone, and fat situation.

Dairy Cow Nutrition

Nutrition of Calves.—The experiments on the grazing management of calves in relation to growth and thrift have now reached the stage where they can be discontinued in their present form. Six years' results of rotational versus set grazing techniques now available leave no doubt as to the superiority of the rotational system. The final checked figures for live-weight for comparable groups are as follows:—

Year.	Rotational.		Set-stocked.		Difference.
	Number.	Weight.	Number.	Weight.	
		lb.		lb.	lb.
1940–41	16	416	16	354	62
1941–42	16	423	16	360	63
1942–43	11	439	10	374	65
1943–44	25	385	26	334	51
1944–45	28	405	33	279	126
1945–46	21	332	22	262	70

All weights as at 31st March.

For the first four years the grazing differences were introduced at weaning-time. For the last two years they became effective one month from birth. This accounts for the increased difference in 1944–45. The drought conditions were undoubtedly responsible for the lower weights during the present season. It is of interest to note, however, that, despite this, the difference between the two groups was considerable.

Nutrition of Yearlings.—While previous work has indicated that the better growth obtained by rotational grazing of calves prior to the winter results in better-grown yearlings and two-year-olds and eliminates the death-rate during the winter, the normal practice in the past has been to winter both lots of calves from May onward under a rotational system. A preliminary experiment during 1944–45 continued the two treatments right throughout the winter. Set-stocked calves suffered a mortality of 50 per cent. and the

survivors weighed 136 lb. less as rising two-year-olds one year later than the rotational animals, in which no mortality occurred. Results, however, were partly influenced by the needs of other experiments.

During the past year a strictly controlled comparison of the two systems of grazing has been possible. The set-stocked "yearlings" were drenched with phenothiazine regularly every three weeks from January. Results were as follows:—

Live-weights

Treatment.	1945.				1946: March.	Number.	Deaths.
	March.	June.	September.	December.			
	lb.	lb.	lb.	lb.	lb.		
Controlled (rotational) ..	405	472	538	664	703	28	0
Uncontrolled (set-stocked) ..	279	317	368	532	564	33	1
Difference ..	126	155	170	132	139	..	..

The controlled group were shifted every two to three days until September. During this period they were also given access to autumn-saved pasture for two hours daily (eight weeks) and were fed silage to appetite and hay *ad lib.* in rack. The average consumption of silage was 18½ lb. per head per day for nineteen weeks, and of hay 1¾ lb. per head per day for the same time. From September onward they were employed as "followers" of the milking-herd under a rotational-grazing plan. Drought conditions necessitated feeding of silage (15 lb. per head per herd daily for eight weeks) from mid-February. The uncontrolled group were set-stocked on a "dry stock area" in two paddocks totalling 34 acres for two months in each paddock. Hay only was provided on a rationed basis, and an average consumption of 2¾ lb. per head per day for eighteen weeks was recorded. The fields concerned carried considerable roughage. From October onward one field (18 acres) maintained this group until the end of January, when both areas became available again after harvest.

Of very definite interest is the marked capacity for recovery from the effects of under-nutrition of the set-stocked animals once food-supplies become plentiful in the spring. The animals from this experiment will provide the "well-grown" and "poorly-grown" two-year-olds for 1946 calving in the experiment next described.

Nutrition of Cows: Lifetime Project.—A long-term experiment has been commenced to determine the effect of different levels of nutrition on the lifetime performance of dairy cows. On a subdivided "controlled-grazing" farm the aim is to provide cows with a high, even level of nutrition throughout their productive lives. On a comparable area, farmed on a more extensive "uncontrolled-grazing" system, cows are subject to the marked uneven level of nutrition resulting from seasonal variations in pasture growth. In the first case rotational grazing plus maximum hay and silage provision is employed; in the second "set stocking" of milking-cows in night and day paddocks and of dry stock on dry stock area, plus limited hay, are the methods used. As from the 1946 calving each of the two herds will be drawn in equal numbers from two-year-olds well reared and poorly reared respectively from birth. These will be produced on the two farms concerned and as described above.

During the current season a trial run has been in progress partly to get the two farms into a pasture condition typical of the two systems in practice, and partly to gain experience of the management problems involved in running an experiment of this

type. On the "controlled-grazing" farm the herd has been composed of well-reared two-year-olds; on the "uncontrolled" farm, of poorly reared two-year-olds. The results obtained indicate the differences that might be expected:—

Live-weights

(From March, 1945, to twenty-four weeks after calving)

Treatment.	March.	Pre-calving.	Post-calving.	Four Weeks.	Eight Weeks.	Twelve Weeks.	Sixteen Weeks.	Twenty Weeks.	Twenty-four Weeks.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
"Controlled" (19 head)	770	870	771	765	764	787	813	831	838
"Uncontrolled" (18 head)	634	704	615	610	624	658	691	710	721
Difference ..	136	166	156	155	140	129	122	121	117

Production Averages

(Up to 17th March)

Treatment.	Milk.	Test.	Fat.	Days.	Number of Cows.
	lb.	Per Cent.	lb.		
"Controlled"	4,281	5·4	233	216	19
"Uncontrolled"	3,726	5·3	199	216	18
Difference	555	0·1	34	..	..

The production difference in favour of the controlled group is likely to be greater by the time the season is complete, due to a tendency for the heifers of the uncontrolled group to dry off earlier.

The experiments in progress with cows under carefully controlled nutritive conditions on pasture involving large differences in the level of feeding provided an opportunity for building up both base-line information on the blood status (acetone bodies, sugar, calcium, magnesium, and phosphorus) of New Zealand dairy cattle and information on the possible effects of differential nutrition on such characteristics. These characteristics are of possible significance in relation to diseases associated with parturition and lactation (ketosis, grass staggers, and milk-fever).

Blood samples were taken weekly for a month before and a month after calving; thereafter they were taken monthly. Urine samples were taken monthly for acetone estimations.

Results have not yet been fully examined.

Nutrition of Cows: Winter Feeding.—An experiment has been commenced to determine the effect of different levels of feeding during the winter on the subsequent lactation.

Measurement of Digestibility of Cow Pastures.—The great practical difficulty of obtaining information of any value as to digestibility, nutritive value, and intake of dairy-cow pastures which arises from the fact that a digestibility trial involves a fourteen-day feeding period, during which time any pasture is changing in character, while in practice the dairy herds graze a field in one to two days, has made it necessary to investigate possible modifications of existing methods. The great quantity of feed required to be cut and hand-fed to cattle in digestibility work is also a major difficulty for many reasons. Accordingly, work during the past year has been concentrated upon the possibility of using the sheep instead of the cow as the measuring animal, and dried

grass instead of fresh to overcome the time growth factor. Results are still incomplete, but it appears that sheep may be able to replace cows for much digestibility work, that a saving in the quantity of feed needed may be still further reduced by feeding half rations, and that, while drying appears to lower the digestibility of pasture, the use of dried grass is still a possibility.

Improvements in drying might eliminate the reduction in digestibility, or it might be found that the reduction is a relatively constant figure for which a correction can be made.

Trace Minerals

Cobalt.—The present chemical method for cobalt is very slow, and an attempt is being made to perfect an improved rapid method. This involves the direct extraction of cobalt from wet digests, suitably buffered, using a-nitroso-beta-naphthol as colorimetric reagent and iso-amyl alcohol as extractant. Results so far obtained have been encouraging.

Copper.—The effectiveness of top-dressing with copper salts in the control of peat scours in dairy cattle has been further confirmed this year. Improved general health and production of cattle under observation on top-dressed farms have been maintained. The practice of top-dressing with bluestone is becoming widely established on peat-land farms, and copperized superphosphate, prepared commercially, is growing in popularity.

With collaboration from the aerodrome services of the Public Works Department, an experimental trial of aerial top-dressing with bluestone is projected. Preliminary work to find suitable diluents to promote free running of the ground bluestone has been completed and approximately 0·3 per cent. magnesium carbonate light has been found the most suitable.

While supplements of copper have effectively controlled peat scours, there is evidence that copper deficiency is not alone the cause of the disease. Experiments are being conducted to determine whether the presence of a small excess of molybdenum in the pasture is a contributing factor to the disease.

Control of enzootic ataxia in lambs is effective if ewes are placed on top-dressed pasture two months before lambing or if lambs are drenched regularly twice weekly from birth.

Chromic Oxide Method of measuring Total Dry Weight of Faeces.—The principle of this method is to dose chromic oxide each day for a period to a sheep and to calculate the total dry weight of the fæces from determination of chromic oxide in a portion of the fæces, the assumption being that chromic oxide is unaffected by passing through the alimentary tract and that consequently the whole day's output of fæces would contain, on the average, the weight of oxide in one day's dose.

The advantages of the method for field observations on appetite are obvious, since the collection of all fæces in bagging trials is extremely difficult.

It was found in the first instance that the chemical method for chromium required revision; improvements have now been effected so that the requisite degree of accuracy is obtainable.

With this new chemical method it has been shown that all the chromic oxide dosed is passed through the alimentary tract. There are no losses by absorption or by lodgment in the digestive tract. A more even distribution of chromic oxide in fæces is obtained by dosing twice daily with "explosive" capsules (containing about 10 per cent. of sodium bicarbonate). Even with these precautions, distribution is somewhat uneven and it is necessary to collect the majority of the day's excretion to get a reliable average concentration of chromic oxide.

There is some variation in day-to-day output of dry weight of fæces by sheep, and it was necessary, before the chromic oxide technique could be tried, to determine the minimum period that would give a reliable daily average. All the fæces were collected from untreated sheep each day for twenty days. An average for any six days was found to be very close to the twenty-day average.

Final trials of the suitability of the chromic oxide method are now being made, a minimum period of six collection days being employed in the work.

In the course of the work it was found that a loss of dry matter occurred in fæces stored without preservative. The most effective method of preservation was to stir in 5 per cent. of toluene.

Ketosis

Dairy Cattle.—A study of this disease in the 1945–46 season confirmed the view that ketosis as a separate entity is relatively uncommon; it occurs chiefly as a complicating factor in other diseases such as grass staggers and, to a lesser extent, milk-fever, red-water, and metritis. Grass staggers, however, does occur without ketosis, and the view that ketosis is the factor precipitating grass staggers is not supported.

The use of Rothera's test for ketone bodies in urine proved of definite diagnostic value in differentiating simple ketosis from complicated cases. An improved and simplified form of the test has been devised for field use employing a tablet of reagent mixture which is wetted with a few drops of urine.

Carbohydrate supplementation is a satisfactory treatment of uncomplicated ketosis: successful therapy of complicated cases depends on the tractability of the complicating disease.

A study of the ætiology of ketosis is in progress on four farms, two of which normally experience an appreciable amount of ketosis diseases, while the other two are not affected. At the present stage the difference in disease incidence appears due to relatively minor factors in animal husbandry and management.

Sheep.—Chemical studies on blood and urine and chemical and histological studies on aspiration biopsy samples of liver were made on a group of pregnant ewes in which ketosis was produced experimentally by restriction of food intake. It was found that marked ketonaemia and ketonuria developed after fourteen days on the restricted diet. There was a rise in the total fat content of the liver, a slight rise in cholesterol, and a fall in liver glycogen.

A field trial was made to determine, under controlled conditions, the efficiency of a lick containing potassium iodide, dicalcic phosphate, and other ingredients in preventing ante-partum paralysis in ewes. The lick had shown promise in trials conducted the previous year. There were three groups of approximately 100 ewes, a control with no lick, a group on the test lick, and a group on salt-bone flour lick containing potassium iodide. Unusually favourable conditions of pasture growth prevented development of ketosis in any of the ewes, and in consequence no conclusions could be drawn. The test lick proved much more palatable than the salt-bone flour lick.

General Biochemical Work at Ruakura

The majority of the grass alkaloid work carried out by the chemical staff while in Wellington has been worked up and published. Fats and "solids not fat" have been estimated on bi-weekly samples from dairy experiments. The possible use of dyed plastics as "markers" in digestibility trials has been the subject of preliminary investigation, and work on the dyeing of polystyrene is under way. As an aid to improving digestibility determinations, experiments have been commenced to isolate that part of the lignin fraction of pasture plants and other feeds which is not digested. The influence of conditions of drying of pasture on composition is being studied. To avoid the reduction in nitrogen and ether extract and the increase in lignin in fæces resulting from the conventional method of drying, as compared with alcohol-preserved fæces, the whole question of drying and preservation of fæces has been made a subject for research, and alternative methods are being tried out. Freeze drying, drying with CaO, and vacuum drying at room temperature are being compared on the same samples. Work on cobalt in relation to bush sickness has been finalized

and a report is being prepared for publication. The use of the Cenco-Sheard spectrophotelometer and the Hilger quartz spectrograph for determining minute amounts of cobalt has been studied and a satisfactory technique worked out.

PARASITOLOGY

Blindness in Calves after Phenothiazine Dosing.—Investigations have been carried out on an inflammatory eye condition which has been reported quite frequently in calves after the administration of phenothiazine as a worm drench. The condition has not been reported from overseas, in spite of the fact that very large numbers of animals have been dosed with the drug. In New Zealand, however, it has occurred frequently and has become an important problem in some districts. It has been shown that the keratitis is a manifestation of a photosensitization in which the usual skin lesions are very slight or absent altogether, but in which the eye is sensitive. The eye lesions do not occur in dull weather or when animals are protected from direct sunlight. The critical period during which protection is necessary is the day following dosing. In practice the earliest warning of impending damage to the eye is weeping, and if, when this occurs, measures are taken to remove animals from sunlight, the severity of injury to the eye will be greatly reduced.

The use of phenothiazine in farming practice as an anthelmintic in sheep does not cause keratitis in these animals. Therefore, studies of the metabolism of phenothiazine have been made in sheep as well as in calves. Two derivatives, phenothiazine sulphoxide and phenothiazone, have been found regularly in the blood of calves, and the former has been detected in the aqueous humour. In sheep, when the drug is given in therapeutic amounts, usually the phenothiazone only is present in the blood and neither derivative is present in the aqueous humour; when massive doses are given to sheep, the sulphoxide also appears in the blood and aqueous humour, and in such cases keratitis is produced after exposure to sunlight.

The radiations which produce keratitis are in the long ultra-violet, 320 to 380μ, which is the region most strongly absorbed by the sulphoxide of phenothiazine. The responsible wave length differentiates the condition from "photophthalmia" as seen in snowblindness and so-called "flash injury" of electric arc welders, where the injurious wave lengths are shorter than 300μ. It is of interest that a carbon arc lamp with "sunshine" carbon poles was a suitable source of artificial light to produce eye lesions in susceptible animals.

The work so far completed indicates that the sulphoxide of phenothiazine is the photosensitizing agent. The sulphoxide has been found in the abomasum and other parts of the intestinal tract of calves and sheep, and its occurrence in blood and sometimes in the aqueous humour has already been mentioned. Further studies of the mechanism of its formation and of its metabolism and excretion are in progress.

Phenothiazine in Salt Lick.—A field experiment is in progress to examine the possibility of supplying phenothiazine incorporated in a salt lick. During the first season, lick consumption of a 1 : 9 mixture was very low and no benefit was recorded. During the present season lick consumption per sheep has been greater, but final results are not yet available.

Dipping Experiments.—Preliminary dipping experiments comparing D.D.T. and "666" with standard Derris and arsenic preparations for the control of keds and lice on sheep have been carried out. Against keds, broadly comparable results were obtained with D.D.T. 1/2,000, "666" 1/16,000, and Derris (5 per cent. Rotenone) 1/2,000, all of which were effective, although complete eradication was not obtained in any group at these concentrations. All were superior to a solution of sodium arsenite containing 0·2 per cent. arsenic.

Against biting lice, D.D.T. 1/2,000 and "666" 1/8,000 were both highly effective, but again these concentrations could not be relied upon to give complete eradication.

Resistance and Immunity.—Experiments have been initiated to study the phenomena of immunity and resistance to internal parasites in sheep. Artificial infestations are being used in lambs reared under worm-free conditions.

Hydatid Disease.—Attempts have been made to determine the length of life of "eggs" of *Echinococcus granulosus* under field conditions. The technique used consists of exposing to outdoor conditions very heavily infected dog fæces mixed with fine soil. After selected intervals, the mixture of soil and fæces is suspended in water and administered to sheep by stomach tube. The animals are then examined either by exploratory operation or on slaughter after a lapse of several months, when developing cysts in the liver can be detected and identified.

Poultry Diseases

Toxic Heart Degeneration in Fowls.—Sudden deaths in apparently healthy fowls have been observed for a number of years, mainly in certain parts of the Canterbury and Otago Provinces, in which the following characteristics have been observed: an enlargement and parboiled appearance of the heart muscle, pericardial and abdominal effusion, and congestion of the venous system. The altered appearance of the heart muscle is due to a microscopically noticeable partial or complete degeneration of the muscle fibrils.

Bacteriological examination has yielded negative results and no success has been obtained from attempts to transmit the disease by contact or by the inoculation or feeding of material or cultures from infected animals. The present indications are that the disease is not infectious, but is due to a toxin with selective action on heart muscle.

Coccidiosis of Chicks.—Outbreaks of coccidiosis causing up to 70 per cent. mortality in chicks of about five weeks of age were effectively controlled by the administration of sulphamezathine as a saturated solution (25 g. per 1 gallon of water) in lieu of drinking-water for three consecutive days. If given to the birds when blood was first observed in the droppings and symptoms of inappetence and droopiness were already noticeable in a number of chicks, the treatment was effective in reducing mortality from the initial 70 per cent. to as low as 3 per cent. The cost of the drug per five-weeks-old chick was two-thirds of a penny per day, an expenditure well warranted in view of the effectiveness of the treatment.

Previous small-scale experiments gave evidence of an acquired immunity in birds that had been tided over an acute infection.

Apiculture

The main work has been an investigation of a case of poisoning by honey which occurred at Pongakawa. It was found that the source of the poison was honey-dew excreted by a hopper (*Scolipopa australis*) infesting the tree tutu (*Coriaria arborea*). The toxic principle was isolated and identified in collaboration with the Dominion Laboratory. It proved to be a convulsant poison belonging to the picrotoxin group and related to tutin. A special set of environmental factors favours the production of poison honey—viz., dry weather, which favours multiplication of the hopper; location of hives near flora largely trees and including tutu; and absence of other sources of nectar, which drives the bees to collect honey-dew.

The history of previous cases of poisoning by honey suggests that similar circumstances were responsible. The knowledge gained in the present study will enable control to be effected by exclusion of apiaries from potentially dangerous areas.

It was found, in small animals, that honey poisoning and tutu poisoning could be controlled by dosage with nembutal.

Work has been carried out on the provision of suitable substitutes for pollen which can be used in pollen-deficient areas. A mixture of soya-bean flour and pasteurized yeast has produced the best results, under controlled conditions, at Otira, Heriot, Omakau, and near Wanganui.

Other work has included a study of fermentation in honey due to absorption of moisture during extraction and the examination of a number of samples submitted by Apiary Instructors.

FIELDS DIVISION

REPORT OF MR. J. M. SMITH, DIRECTOR

Climatic conditions varied considerably throughout the Dominion during the season under review. Some areas experienced good growing conditions with ample rains and favourable temperatures, but other parts of the country experienced severe conditions through floods, hail, snow, gales, and drought. The northern portion of the North Island had a good autumn, but the winter was cold and wet with a late, poor spring. Dry conditions set in during November and the drought developed until conditions of pastures, crops, and stock became extremely serious. These same conditions prevailed on the East Coast, although a better spring was experienced in that district. Production generally, and dairy production in particular, received a serious setback as the result of these dry conditions. In marked contrast, Taranaki and the west coast of the North Island have had a very good season with well-distributed rainfall. In Southern Hawke's Bay and the Wairarapa a fairly normal season was experienced, with dry conditions during the summer. The autumn in Canterbury was very wet with much flooding, conditions which continued well into the spring, with disastrous results to the autumn and early spring crops. These conditions are very largely responsible for the comparatively low acreage of wheat in Canterbury during the 1945–46 season. Generally in Canterbury the summer was dry with conditions verging on a drought in some districts, although South Canterbury experienced much dull foggy weather during the harvest. Heavy falls of snow in July with gales did much damage, while later local hailstorms of considerable severity took their toll of production. Heavier rainfall than normal was experienced in Otago and Southland and cold conditions retarded growth, while the wet state of the soil delayed land preparation for crops. Improved weather conditions in the summer and autumn did much to change what at one time promised to be a poor season into a good one, with ample supplies of stock fodder and good crop yields.

Extension Service

The main activity of the Fields Division is the extension service by which, through personal visits to farms, lectures, demonstrations, broadcasts, articles, and correspondence, farmers have had made available to them advice on such matters as cropping, pasture management, use of fertilizers and lime, feeding of live-stock, land-improvement, and farm-management in all its phases. During the war the instructional staff was engaged mainly on such activities as linen-flax production and the growing of vegetables for the Armed Services, and extension work had to be reduced to a minimum. Now that officers have been released from this special war work and those who have been with the fighting Services have returned to normal duty, extension work is being stepped up. Additional trained staff is being provided for, and a number of returned servicemen are taking special courses at the two agricultural colleges to fit them for work in the field. It is anticipated, therefore, that within a year or two the instructional staff will be back at full strength and the full service expected and required by the farming community will again be available.

Pastures

Except in the drought-affected areas, pasture growth has been good, although somewhat delayed in the spring. In the area that experienced the drought, pasture growth faded in the early summer, and even the paspalum pastures of the north, which usually stand up to very dry conditions, were no better as far as production was concerned than the rye-grass-white-clover pastures. The shortage of fertilizers during the war is now beginning to make itself very evident in the condition of pastures generally. Nevertheless, the way these pastures have produced under the adverse condition of lack of fertilizers is amazing, and gives some support to the contention that the residual effect of fertilizers is greater than was generally supposed. The

continued increasing demand for high-class pasture seed indicates that farmers generally are supporting a policy of pasture replacement with high-producing, long-lived strains of grasses and clovers. As a result of the lack of fertilizers and the deterioration of certain pastures it is anticipated that the next few years will see an extensive programme of pasture renewal. Except in the Auckland Provincial District, hay and silage crops were fairly good. This was fortunate, as it enabled good stocks of hay to be made available to the drought-affected area.

Crops

The wet autumn and spring conditions in most districts were not conducive to extensive cropping. The result was that the area in autumn-sown crops, particularly wheat, was reduced, while the area in spring-sown crops increased. Details of estimated crop acreages and the comparative figures for 1944–45 are as follows:—

	1944–45. Acres.	1945–46 (Estimated) Acres.
Wheat	188,771	165,000
Oats (all purposes)	228,470	206,000
Barley (all purposes)	43,200	61,000
Potatoes	29,774	23,800
Onions	1,915	1,250
Peas	43,970	40,000
Maize (for grain)	8,473	6,300

Wheat.—As previously mentioned, the adverse weather conditions reduced the total acreage, although the area spring-sown, particularly in the North Island, showed an increase. Actually, the weather suited the filling-out of spring-sown crops and excellent grain was harvested in good condition.

Oats.—The area in oats was down on that of the previous year, while present indications are that the yield will also be down. In Southland much lodging occurred, but despite this good-quality grain is being harvested.

Barley.—An increased area was sown to barley throughout the North Island and Canterbury, but in Marlborough and Southland the area appears to be down. The quality of the grain already harvested is excellent and the yields good.

Potatoes.—Arrangements were made early in the season to have an increased area planted in potatoes to meet the demands of the United States Joint Purchasing Board. Owing to changed conditions following VJ Day, the programme had to be curtailed, although some planting had then been done. In Hawke's Bay the dry weather retarded growth, but in the Manawatu and Rangitikei good crops resulted. In Canterbury dry conditions in January and February checked growth and caused some early ripening, but in South Canterbury yields should be good.

Onions.—The area in this crop in the Manawatu continues to increase and the Opiki district bids to become one of the main onion-growing districts. Pukekohe crops were good and were harvested in fair condition. In Canterbury there are prospects of a good harvest with promising yields. Control of weeds by spraying was practised in the Manawatu with good results.

Peas.—There was an increase in area in peas in Marlborough and Canterbury, but a decrease in South Canterbury. Yields in this last-named district are good, but in most other districts the yield will be down a little. Gales did much damage to some crops just prior to harvesting. Grain quality should be good as compared with last year.

Maize.—The 1944–45 crop yielded exceptionally well with good-quality grain. The area for this season's crop showed an increase and despite the dry conditions promises to produce a fair crop under the very adverse circumstances. A large area of the crop intended for grain was, however, utilized as green feed.

Agronomy Section

During the last year a reorganization of departmental activities relating to seeds and seed-production has taken place, resulting in the establishment of an Agronomy Section. This Section has absorbed most of the work undertaken under the heading of crop utilization, in addition to carrying on the work involved in seed certification and seed-production generally.

The 1945 harvest was not a favourable one. Perennial rye-grass seed crops were severely attacked in most districts by the blind-seed fungus. Thus, while yields were slightly lower than usual, the germination of the seed harvested has been much below the general average for this seed. The Italian rye-grass and cocksfoot crops proved to be rather better than normal, as also did the brown-top, chewing's fescue, and crested dogstail seed crops.

The acreages of red and white clover closed for seed-production were much larger than usual, but owing to the very adverse conditions experienced in the late summer and autumn of 1945 the yield per acre of each of these seeds was far below any experienced during the past twenty years. Total production accordingly showed an appreciable reduction compared with that of some of the war years.

The high level of the pea acreage grown in the 1943–44 season was maintained in the following season, but, though the yields were also higher, seasonal conditions affected the quality of the product very adversely.

As a result of the activities of the linseed-oil-extraction plant in Dunedin, the acreage devoted to the production of linseed for oil-extraction purposes has increased several-fold, and in the 1945 harvest over 4,000 acres were saved for this purpose. At the same time a reasonable area was sown to linen flax for the production of fibre, surplus seed from which industry was also diverted for oil-extraction purposes.

The 30,000 acres planted in potatoes gave promise of an excellent harvest, but continued wet weather and widespread attacks of late blight, followed by flood conditions in South Canterbury, caused heavy loss of tubers.

The acreage of onions harvested in 1945 was approximately double the normal pre-war area. This abnormal crop presented certain storage difficulties, but these were finally overcome by the use of buildings situated on the Addington and Palmerston North Showgrounds.

Contract Growing of Seeds.—In this work close liaison is maintained with the Agronomy and Grasslands Divisions of the Department of Scientific and Industrial Research. The procedure followed is to take over from either Division the nucleus lots of new material and multiply these on selected farms under a system of contract growing before the material is released into commerce. By this means strict control over the material is maintained until supplies are increased sufficiently for release into commerce. The returns from the sale of seed grown under contract are shared with the Divisions producing the nucleus material, and thus a useful contribution to the initial cost of selection is provided.

This scheme was first inaugurated in 1935, and at the present time six species of grasses and clovers and seven varieties of field-crop seeds are being grown under contract. The extent of these operations is evident from the fact that the total area at present under contract approximates 650 acres.

Seed Certification.—In the early years of the seed-certification scheme the supply of the variety or strain for certification purposes depended mainly on a source being available under conditions of nature. Thus, Hawke's Bay and Poverty Bay perennial rye-grass became the basis for certified seed of this species, the supply of certified seed potatoes depended on the availability of good crops already in production, and so on. With the development of a plant breeding and selection programme by the Plant Research Bureau of the Department of Scientific and Industrial Research, selected strains have replaced the "natural" strains in most of the seeds now coming under certification. Thus, the production of seeds under certification becomes the third and final stage in the development of a new strain or variety, preceded by the two steps involving selection and multiplication under contract respectively.

The scope of the scheme is continually being extended, and, while fluctuations may occur in the quantities of any individual seed being certified due to seasonal conditions and alterations in the market requirement, the total quantity of seed being certified is increasing at a steady and very appreciable rate.

The following table sets out the total quantity of the various seeds certified during 1945 :—

Perennial rye-grass	405,656	bushels.
Italian rye-grass	221,807	bushels.
H1 rye-grass	6,150	bushels.
Cocksfoot	443,966	lb.
Brown-top	594,258	lb.
White clover	1,655,481	lb.
Montgomery red clover	292,356	lb.
Broad red clover	15,399	lb.
Seed wheat	25,690	bushels.
Sweet blue lupin	617	bushels.
Rape	239,098	lb.
*Turnip	164,172	lb.
*Swede	122,584	lb.
Chou moellier	4,422	lb.
*Mangel	4,071	lb.
Onion seed	9,830	lb.
Seed potatoes	3,575	tons.

* This seed is termed "Government Approved."

Production of Brassica Seeds.—Arising out of war conditions the Department organized the production locally of the Dominion's full requirements of turnip, swede, rape, chou moellier, kale, and mangel seeds. Owing to the problems associated with the production of these seeds, it was deemed advisable for the seed crops to be grown under close supervision, and arrangements were made for certain merchants to undertake commercial seed-production from selected stock raised by the Plant Research Bureau of the Department of Scientific and Industrial Research or by this Department.

This procedure has enabled New Zealand to become self-supporting in her requirements of these seeds, and even to develop a small export trade in rape seed. The operations require closer supervision through all stages than is the case with other crops. In the case of turnips, swedes, kale, and mangel seed, where the selections available are not yet claimed to be superior to the stocks previously imported, the term "Government Approved" is used as a description rather than the term "Certified."

In view of the success which has been achieved in the production of these seeds and the fact that already in the case of rape and chou moellier improved strains have been developed, it is intended to continue local production and to concentrate on the raising of strains and varieties more suited to New Zealand's requirements. The work will require to be carefully controlled, both to maintain quality and to ensure that production is in line with consumption, and accordingly it is proposed to continue the operations through selected mercantile firms who are in a position to handle the growing and wholesale distribution of the seed.

Exports and Imports of Seeds.—Control over the export of seeds has been continued in order to ensure that, despite the great demand and high prices offering from overseas markets, the local market has not been denuded of supplies. It is the general policy, once local requirements are assured, to permit free export through mercantile channels of all locally grown seeds, in accordance with sales made on overseas markets. The recommendations of the Combined Food Board, however, in relation to the supply of seeds to certain European countries are given effect to through the export-control system. Import control of seeds has been governed by the necessity of keeping overseas purchases at a minimum, while at the same time ensuring that seeds essential to the welfare of New Zealand farming, if available overseas, are imported in sufficient quantity to meet local needs.

The Commercial Advisory Committee, comprised of members of the New Zealand Grain, Seed, and Produce Merchants' Federation, has given valuable assistance in the implementing of the above-mentioned controls.

Onion Marketing Advisory Committee

The Onion Marketing Advisory Committee, constituted under the Board of Trade (Onion) Regulations 1938, and consisting of representatives of growers and merchants, acts in an advisory capacity in matters affecting the production and marketing of the onion crop, and has been of material assistance in the difficulties associated with an attempt to line the production of this commodity with the varying requirements necessitated under war conditions and the change to peacetime demand.

Potato Advisory Committee

The Potato Advisory Committee, set up under the Primary Industries Emergency Regulations 1939, and having similar representation to the Onion Marketing Advisory Committee, has given close watch to the production of potatoes during the war, and its advice has been readily accepted in implementing the control over the potato industry necessary to fit it into the wartime scheme.

This Committee has continued its functions in relation to the 1945–46 crop, but its members are now giving consideration to ways and means of placing the post-war industry on a more stable basis than existed before the outbreak of war.

Barley Advisory Committee

Set up before the war to assist both the producers and users of malting-barley, this Committee continues to render a useful service. It has no statutory powers, but by the close co-operation of the representatives of all parties it has been instrumental in bringing about an improvement in the general trading conditions between seller and buyer. At the same time, the work of the Committee has been most helpful to the growers of barley with regard to their production methods.

Seed-testing Station

For the year ended December, 1945, the receipt of slightly over 35,000 samples was recorded, representing an increase of nearly 30 per cent. on the total for the previous year—itself a record.

The total samples worked were (previous year in parentheses):—

Purity analyses	29,366	(22,350)
Germination tests	35,011	(26,710)
Ultra-violet-light examination	4,150	(4,675)
Picric acid tests	4,780	(3,455)
Totals	73,307	(57,190)

This is an increase of 16,117 over 1944.

Although during the war substantial additions to staff and equipment were approved, neither has been secured in full, and the rate of development of the Seed-testing Station has been markedly exceeded by that of the seed industry.

It is clear that the Department cannot hope to provide the testing services required by the industry until the Station is re-accommodated with further augmentation of both staff and equipment.

In this respect the status of the Station, both in New Zealand and overseas, is now that of a Dominion institution, and it is to be hoped that the consolidation of this status will be effected by the provision of a suitable building for the Station's occupancy.

Seed Quality and Trading.—Generally, quality for 1945 production was poor, while an export demand exceeded available supplies of appropriate quality. Quantities of perennial rye-grass and white and red clovers of qualities much below those usually

demanded by export buyers were shipped towards the end of the year. Substantial shipments were also made to the Continent, where it is anticipated a market should be found for some years.

Mechanical damage to red clovers, &c., was less marked, except for Wairarapa-grown lines, where headers were used extensively for the first time. Many lines of lupins, however, were severely damaged.

Perennial Rye-grass.—Neither the 1945 nor the 1946 season has been favourable to the production of rye-grass, either perennial or Italian, mainly through the high incidence of blind-seed disease. The increasing concern of growers and merchants in Canterbury, Otago, and Southland regarding the future of rye-grass seed production is understandable in the light of their experiences during the past four years, and it is to be feared that many growers will seriously consider the abandonment of rye-grass seed production.

It is possible, of course, that four unfavourable seasons could be followed by four excellent seasons, but the fact remains that only in a few favoured areas —North Canterbury, Hawke's Bay, and Poverty Bay—can crops of perennial rye-grass of high germinating capacity be anticipated with any degree of certainty in three seasons out of five.

Successful control would appear to lie only in the direction of the breeding of strains resistant to blind-seed disease, but it is believed that attempts in this direction have proved to be not very promising.

Nevertheless, with the prospective overseas markets in sight, an inability to produce export quality in the majority of seasons must be regarded seriously and be accepted also as a strong incentive to the prosecution of investigation into the question of resistance.

The substation set up at Timaru in January, 1946, examined and reported upon 1,159 green sheaves, and 125 were received at Palmerston North. This service has been widely appreciated, and has undoubtedly been the means of preventing the harvesting of much unsaleable seed. It is anticipated that this service will be extended in coming seasons.

Seed Prices.—Prices during 1945 for all seeds rose to what were then regarded as fantastic levels, but, with the exception of cocksfoot seed, prices this season have continued to advance. For perennial rye-grass North Island values have remained fairly steady, but in the South Island the competition among growers for pedigree seed has forced prices of seed of mediocre quality up to and over 60s. per bushel, with corresponding firming of lower grades, in which permanent pasture at 45 per cent. cannot be bought under 10s. to 12s. per bushel.

Spectacular returns have been received by growers for clovers, especially for cow-grass. In Marlborough £120 per acre gross from light second-class land is not an unusual return, while for uncertified Montgomery red clover over 4s. has been paid. In the light of these prices, the North Island retail buyer will have to meet record high values brought about largely by high export parity plus frantic buying by forward sellers.

Seeds Purchasing.—The total value of seed purchased for Government Departments was approximately £75,000, covered by 493 requisitions. Full use was made of the opportunity to relieve growers of substantial quantities of low-germinating perennial rye-grass at favourable prices.

General.—Visits from farmers, seed-growers, and educational and commercial bodies have been received in increasing number.

Services' Vegetable-production

Services' vegetable-production was established in 1942 with the object of supplying much-needed vegetables to the Armed Forces in New Zealand. With the advent of large numbers of Forces from the United States of America, the demand for fresh vegetables changed greatly in respect of both quantity and type.

Consequently, Services' vegetable-production was increased to meet the demand. As the theatre of war moved away from New Zealand and as our own Forces were reduced Services' vegetable requirements underwent further marked changes. The change was one from the production of a wide range of fresh vegetables to a much narrower range of vegetables that could be held and carried in cool storage for several weeks.

At this time commercial growers increased their acreage under vegetables to a very large extent. This, combined with the reduced demand from the Forces, necessitated a partial closing down of S.V.P. By the autumn of 1945 an area of 3,495 acres out of a total of 5,181 acres had been sown down preparatory to handing the land back to the owners. This left an area of 1,686 acres available for cropping during the 1945–46 season.

During the past year vegetables produced by S.V.P. were distributed through the Internal Marketing Division. Some supplies went to United States Forces overseas, some to New Zealand Forces in this country, and some went on to the open market in various parts of the North Island. On account of the overseas United States Forces' demand ceasing suddenly, considerable quantities of vegetables specially grown for them could not be uplifted.

In certain areas—namely, Greytown, Hastings, and Levin—a total area of 153 acres of wheat and barley was grown. This was done because this ground was not required for growing vegetables and because of the great necessity for wheat and barley production. These grain crops were very successful with good yields.

The regrassing of the area of 1,686 acres is to be completed this autumn. It is anticipated that S.V.P. will be finished by the end of September, 1946, by which time all the properties will have been sown down and handed back to the owners. The closing-down of the projects has involved a large amount of organization from both the field and the clerical aspects.

Most of the equipment has been sold by auction and prices have been reasonable on the whole. Buildings, tractors, and motor-vehicles have not been sold by auction, but have been disposed of by the War Assets Realization Board.

Councils of Primary Production

Primary Production Councils were set up as a wartime organization, and with the cessation of hostilities consideration was given to the winding-up of activities, and the Councils and their Committees actually went out of being on 31st March, 1946. During the war this organization played a very real part on the "home front," and the splendid figures of production during this most difficult period can be very largely attributed to its activities. The National Council of Primary Production, the 37 Provincial Councils, and the 272 Production Committees, through the 1,000 active members, greatly assisted the Government through the various Departments of State in effecting a just and equitable distribution in the interests of national production of those farming commodities that were, through force of circumstances, placed under stringent control. Much of this work was of a thankless nature, as, for instance, where decisions required to be made with regard to farm man-power and its relation to the Armed Services, and where the few available items of farm equipment had to be allotted to hundreds of deserving cases, but at no time did the Councils or Committees shirk their responsibilities.

Field Experimental Work

The activities of the past year have been largely concerned with reorganization and planning for the expected expansion of activities in the coming years. During the war the number of field experiments was reduced from an average of approximately 1,000 to 228 in 1943–44, and while the number of trials open is only 331 at present, the laying-down of new experiments is proceeding as fast as available staff and facilities permit. It is hoped to secure a considerable quantity of equipment which will greatly assist in improving the accuracy and volume of work undertaken in the future.

The Marton Experimental Area continues to provide useful information in respect of grassland strains, management, and top-dressing. An area has been ploughed for an extensive programme of cropping trials and also pasture-production trials which are being laid down this autumn. Cropping trials will embrace work on varieties, manuring and feeding value of feed barleys, various brassica crops, lupins and various root crops, and two wheat variety trials. The pasture trials involve fertilizer and lime placement studies, examination of various forms of phosphatic top-dressings, trials of timothy strains, and a cultivation trial where the "surface-working" technique, which has received wide publicity overseas, will be compared with usual cultivation practice.

Much work with pastures and crops is being carried out on the various demonstration farms, and it is hoped to further expand this in the future. Such areas are suited to more detailed work than can be carried out in farmers' co-operative trials. However, there is an urgent need for further experimental farms in Canterbury and Otago-Southland. These experimental centres are necessary adjuncts to the farmers' co-operative trial scheme, both from the point of view of the type of trial that can be carried out only on such areas, as well as serving as a link in the chain between fundamental research and farming practice.

Description and Progress of Field Experiments

(1) *Grassland Trials*

(*a*) *Mowing Trials.*—At the Marton Experimental Area four mowing trials are still being continued. These are (i) trial I, which has been laid down for fourteen years, during the last six of which no top-dressing or liming has been carried out. Lime responses are still showing, however, and smaller responses to phosphates (superphosphate, basic slag, ground rock phosphate) are also in evidence. It is intended to keep records of this trial as long as possible, for it provides the only reliable trial on the length of time phosphatic and lime applications remain effective; (ii) trial S, where serpentine-superphosphate is compared with superphosphate and superphosphate plus lime; (iii) trials R and V, where various strains of grasses and clovers are being tested.

Rate-of-growth Trials: The trial at Stratford is being continued, although that at Wairoa will shortly be finalized. It is hoped to commence trials of this nature at Dargaville, Hamilton, Tauranga, East Coast, North Island, Nelson, Canterbury, and Otago. A trial at Kirwee, Canterbury, is being carried on with the co-operation of the Canterbury Agricultural College, Lincoln. Here the production of the new short-rotation rye-grass is being compared with that of perennial rye-grass. Trials carried out at the Winton Demonstration Farm are a comparison of fields sown with a simple and with a complex pasture mixture, and of fields top-dressed with serpentine-superphosphate and reverted superphosphate respectively. A more elaborate trial with the two last-mentioned fertilizers will be commenced this year.

Technique investigations constitute an important phase of this work, and an extensive series of trials is planned for the coming season with the co-operation of the Soil Fertility Research Station, Hamilton. The work of this institution and the Crop Experimentalist's Section are being very closely linked.

(*b*) *Observational Top-dressing Experiments.*—The survey investigating the merits of serpentine-superphosphate in pasture top-dressing constitutes the bulk of these trials, although the "response survey" (which, it is hoped, will eventually provide reliable information concerning the top-dressing of every major soil type in the Dominion) is being continued in conjunction with this survey. A considerable expansion in this work is expected in the coming year. Work with other phosphatic fertilizers in particularly concentrated forms, such as "double superphosphate," will form an important part of future work. This investigation has particular interest in connection with hill-country top-dressing and also top-dressing from aeroplanes. The latter development is being closely watched and a programme of work in connection with it is being commenced this autumn. In all, 78 pasture top-dressing trials are now open, 63 of these including serpentine-superphosphate plots.

(*c*) *Pasture Species and Strains.*—These trials are carried out in collaboration with the Grasslands Division, Department of Scientific and Industrial Research. While the areas sown down some time ago are now being closed, a new series of trials, including an investigation of seeding rates and mixtures, is being laid down this autumn. Paddock-scale trials with short-rotation rye-grass continue to provide valuable information concerning the merits, behaviour, and general place in the farming economy of this new and useful plant, and 35 such trials are now open. Only a few subterranean-clover trials are now open, but a new series of trials involving the surface sowing of legumes (including subterranean clover) on hill-country pastures is being laid down in considerable numbers this autumn.

(*d*) *Trials on Depleted Land: Soil Erosion Control.*—The Pisa Flat Experimental Area continues to provide most valuable information concerning the potentialities of various native and introduced species of grasses and clovers in recovering the depleted land of Central Otago, and this work will be considerably expanded in the coming years.

The problem of soil conservation generally is being undertaken in collaboration with other Government Departments as part of the national scheme being organized by the Soil Conservation and Rivers Control Council, and the work of the Fields Division in this connection will be considerably increased in the near future.

(*e*) *Miscellaneous Pasture Trials.*—These trials include investigations concerning sweet clover and a few other species of possible value; surface-sowing trials; trials with special treatments to improve hay quality; and seed-production trials. Investigations into grass- and clover-seed production, including management, top-dressing, and cultivation, will form an important section of future work.

(2) *Annual Crops*

(*a*) *Wheat-manuring Trials.*—Eight trials were laid down to investigate the response of wheat to superphosphate and serpentine-superphosphate and to see if different varieties behaved differently in this respect. Results to hand indicate that Cross 7 and Solid-straw Tuscan respond in a similar manner to phosphate, but there are still a number of results to come to hand. Manurial trials next year will start a comprehensive programme into the requirements of wheat in relation to soil type. This work will extend over a number of years.

(*b*) *Wheat Variety Trials.*—Seven trials, including new crosses bred by the Wheat Research Institute, were laid down in collaboration with that body. Results from wheat trials generally have been affected by the adverse weather conditions experienced last year and much of the work will be repeated in the coming season.

(*c*) *Oats.*—Two trials, one at Gore and one at Winton, compared new introductions—Royal Scot and Binder—with standard varieties. Yields are not yet to hand. Work with oats and all crops other than wheat is carried out in collaboration with the Agronomy Division, Department of Scientific and Industrial Research.

(*d*) *Barley.*—Five trials with new introductions of malting-barley compared with standard varieties were laid down in North Canterbury and Central Otago. Final results are not yet to hand.

(*e*) *Brassica Crops.*—These trials include turnip and swede variety trials in which New-Zealand-produced seed is compared with imported lines of the same variety; swede variety trials with the new "Dryland" variety; rape variety trials, including new strains bred by the Agronomy Division and a club-root-resistant strain originally produced by the Plant Diseases Division, Department of Scientific and Industrial Research; rate-of-seeding trials with turnips and swedes; and manurial trials, including comparisons of serpentine-superphosphate, reverted superphosphate, and various proprietary mixtures. In all, 18 of these trials are now in progress.

(*f*) *Linen Flax.*—On a specially leased area at Pleasant Point, trials were continued this year. These include a manurial trial with lime, superphosphate, potash, and borax treatments; a variety trial with Concurrent, Liral Crown, Stormont Cirrus, Stormont Gossamer, and Norfolk Earl varieties; a trial with various rates of seeding sown with ordinary coulters and a new type designed to give a more even spread of plants; a size

of sheaf and a " binder versus puller " trial of harvesting methods. Sheaves from these trials are now being processed by the Linen Flax Corporation for straw, fibre, and seed yields, and fibre quality, but field observations confirmed the promising results secured with the new-type coulter in last year's trials.

(*g*) *Peas.*—Two trials in the " dusting " of pea-seed with various organic mercurial dusts and some of the newer treatments indicated that these last-mentioned introductions are likely to prove very valuable in ensuring better field germinations and establishment of peas.

(*h*) *Linseed.*—Three variety trials with the varieties Bison, Walsh, Rio, and Golden Viking compared with New Zealand Commercial were sown in North and Mid-Canterbury. Results are not yet available.

(*i*) *Sugar-beet.*—No trials were laid down last year, due to the late arrival of seed, but an investigation into the costs of growing sugar-beet using modern machinery for sowing, intercultivating, and harvesting will be commenced during the coming season. This work is being undertaken in co-operation with the Department of Industries and Commerce.

(*j*) *Maize.*—Ten trials were laid down in the Dargaville, Bay of Plenty, and Gisborne districts this year, though two of these experiments have been ruined by birds. These trials include manurial trials, liming trials, and varietal trials with the recently introduced " Pfister " types from the United States. There is also a maize-selection area for selection work which is being undertaken by the Agronomy Division.

(*k*) *Potatoes.*—No trials were laid down this season, but a programme of manurial and varietal trials as well as tests of new tuber treatments for improved sprouting is planned for next year.

(*l*) *Other Crops.*—These include trials with new lucerne strains selected by the Agronomy Division of the Department of Scientific and Industrial Research, trials with the promising sweet yellow and sweet blue lupins, and trials with onions. Work with onions includes a test to determine the longevity of the onion-smut-disease organism in the soil and a yield and storage test on various strains of onions.

(3) *Miscellaneous Trials*

(*a*) *Weed Control.*—An officer attached to the Soil Fertility Research Station, Hamilton, has been appointed to investigate weed-control problems generally, and extension work in other districts is carried out with his co-operation and assistance. Insufficient quantities of the " hormone " weed-killers have been available to date and only preliminary work has therefore been undertaken, but with the promise of adequate supplies in the future an extensive series of trials is planned for the coming year. Other very promising results have been secured with kerosene spraying of carrot crops, but farmers should secure advice regarding this before adopting it on a large scale. Trials have also been made with the " D.N.C." (dinitro-ortho-cresol) type of weed-killers, and results will be published shortly.

Great advances have been made in weed-control work generally, and many promising materials for this purpose have been developed. Experimental work with these materials will indicate their uses and limitations under New Zealand conditions.

(*b*) *Pampas-grass.*—Five detailed grazing and palatability trials of various so-called " strains " of pampas-grass have been established, and should commence to give results shortly. In view of the wide divergence of opinion over the value of this plant to the farmer, it is intended to carry out a survey of the success or otherwise of farmers' plantations now established and the uses made of such plantations. There is no doubt, however, that pampas-grass is a valuable fodder plant under suitable climatic conditions and management.

(*c*) *Feed Flavour of Milk and Cream.*—With the co-operation of the Dairy Division and factory-managers, an investigation into the causes of " feediness " in cream was commenced in the Tauranga and Whakatane areas last spring. An endeavour was made to correlate pasture growth and composition with feed taint and also to test ways

and means of avoiding "cress taint" in pastures infested with the weed. Due to the late spring and prolonged summer drought, however, pasture growth was poor and little taint was detected, and it will be necessary to repeat the investigation in the coming season.

(*d*) *Casting Worms.*—Some very promising results have been secured by transplanting casting worms into hill-country pastures in the Raetihi district, and this work is being followed up by 79 experiments of transplanting the worms into pastures in all parts of the Dominion. As it is some years before the worms begin to show appreciable activity, results from this investigation will not be available for some time to come.

(4) *General*

Experimental work is assuming an increasingly important part of the activities of officers of the Fields Division as the extra duties occasioned by war conditions commence to decrease. This is work of direct benefit to the farming community and represents a large volume of investigational work. That the cost of this is remarkably low and that its value to the farmer is often considerable are due in no small measure to the valuable co-operation received from farmers on whose farms the experiments are located. By reason of their close contact with the farming community in connection with their extension and certification work, officers of the Fields Division are enabled to carry out the work with maximum efficiency and with that all-important appreciation of the farmers' viewpoint which is often lacking in investigations of the more academic type.

Summary of Experiments laid down, discontinued, and carried on, 1st April, 1945, to 31st March, 1946

Type of Experiment.	As at 1st April, 1945.	Discontinued during Year.	Laid down during Year.	As at 31st March, 1946.
1. Pasture—				
(*a*) Mowing trials	14	5	..	9
(*b*) Serpentine-superphosphate observational top-dressing	50	29	42	63
(*c*) Other observational top-dressing	19	8	4	15
(*d*) Strains trials	23	8	..	15
(*e*) Pasture establishment	4	3	4	5
(*f*) Subterranean clover	5	2	1	4
(*g*) Miscellaneous pasture species	4	3	2	3
(*h*) Short-rotation rye-grass grazing	33	3	5	35
(*i*) Technique trials	4	..	..	4
(*j*) Miscellaneous pasture trials (haying depleted land)	8	5	4	7
2. Crops—				
(*a*) Wheat manuring	1	3	8	6
(*b*) Wheat variety	1	3	7	5
(*c*) Oats	3	2	1	2
(*d*) Barley	2	2	5	5
(*e*) Brassicas	10	11	19	18
(*f*) Sugar-beet and mangels	2	2	..	..
(*g*) Linen flax	6	6	6	6
(*h*) Onions	3	2	1	2
(*i*) Lucerne	6	2	..	4
(*j*) Lupins	3	3	..	..
(*k*) S.V.P. vegetable trials	55	55	..	..
(*l*) Peas	..	..	2	2
(*m*) Maize	..	2	10	8
(*n*) Other crops	3	3	3	3
3. Miscellaneous—				
(*a*) Pampas-grass	2	1	4	5
(*b*) Ragwort control	6	4	..	2
(*c*) Other weed control	1	4	10	7
(*d*) Feed flavour	..	..	17	17
(*e*) Casting worms	..	..	79	79
Totals	268	171	234	331

Soil Fertility Research Station

The Soil Fertility Research Station at Hamilton officially came into existence on the 1st January, 1946. The objectives of the Station are to carry out research work in connection with the many phases of soil fertility and to pass on to Instructors and other officers of the Department any information which may be of use to them in their advisory service to farmers.

The Station itself is situated some three miles south-west from Hamilton on the main road to Te Awamutu. It is approximately 60 acres in area, is easy rolling country, and the soil principally Hamilton clay loam—one of the major soil types in the Waikato. Previously the area was used for the production of vegetables for war purposes, and the residual value of fertilizers applied during that period is being studied.

At the present time the laboratory staff, who are part of the Station personnel are located at the Galloway ex-ammunition factory, but it is anticipated that laboratory facilities will be provided on the Station itself so that a closer relationship between field and laboratory research workers will then be possible.

The principle activities of the Station may be dealt with under the following headings :—

Field Research.—This is designed to deal specifically with soil problems in the field, and work planned in the immediate future is intended to give data on the various techniques of the measurement of pasture growth, on the response to various fertilizers of the Hamilton clay loam and peat soils of the Waikato basin, on the effect on pasture production of various forms of added nitrogen, and the relative efficiency of certain fused phosphates both from overseas and locally manufactured. Provision has also been made for the laying-down of variety trials on feed barleys and subterranean clover.

Weed Control.—Although this forms part of field research, its importance warrants separate treatment. Work is proceeding on the relative efficiency of various weed-killers, including the new hormone types. Attention is being largely concentrated on ragwort and blackberry. The programme for this work will be greatly expanded during the ensuring year to give information on the control of such other important weeds as nassella tussock and Californian thistle. A herbarium of weeds and pasture plants is being formed as a background and aid to this work.

Quick Soil and Plant-tissue Testing.—Using as a basis work done overseas, a start has been made in the use of quick-test methods for diagnosing deficiencies of the major elements in plants and soils. Experimental kits are being provided to selected Instructors in Agriculture for extensive tryouts under field conditions. It is the aim of the Fields Division to build up as soon as possible a comprehensive service to farmers. An attempt to induce and study the effect of mineral deficiencies in plants of both major and minor elements is being made at the Station.

Laboratory and Pot Culture Studies.—The principal aim of the soil laboratory is to select or devise methods for determining available plant foods which will give results closely correlated with actual crop yields as measured in field experiments. For this purpose a variety of methods, including pot cultures, is being applied to the same areas as are used for field trials. This work and that of the general chemical laboratory are dealt with more fully under separate headings.

Miscellaneous.—Two phases of soil investigation which it is planned to develop in the near future are lysimetry and microbiology :—

(*a*) Lysimeters or soil-drainage gauges will be installed to give data on relative utilization and losses of soil nutrients, including water, under both pasture and arable crops.

(*b*) In regard to microbiology there are many problems of plant-food utilization which can be adequately studied only with a knowledge of the part played by soil organisms, including bacteria, fungi, protozoa, and worms. As facilities become available a commencement will be made with a study of such problems as the efficiency of nitrogen fixation and utilization as influenced by liming, cultivation, and organic manuring, and the defining of factors influencing the numbers and activity of the worm population, especially in relation to special soils such as peat.

Field Investigational Projects

When the Station was taken over it was largely under bare fallow. These areas were sown with Italian rye-grass preparatory to grassing out for permanent trials, including a comprehensive technique trial. The Italian rye-grass was sown with the objective of cutting it with the twofold purpose of providing data for a uniformity trial and also data upon the extent to which a single crop of Italian rye-grass is responsible for removing accumulated plant nutrients from the soil.

The climatic conditions throughout the summer and early autumn were extremely dry and no rain of any significance fell between November and the latter part of March.

Although the Italian rye-grass struck quite well and gave a good cover, it did not grow beyond the 6 in. stage, and consequently the original plans for its use came to nought, and it was ploughed in with the disc plough toward the end of March and sown to permanent pasture.

Portion of the area has been set aside for a barley variety trial designed to compare the feeding value of the following varieties: Newall, Oderbrucker, Cape Smooth Awned, Cape Rough Awned, Black Skinless, and Wong.

One area was sown with Italian rye-grass in three different ways:—

(1) Broadcast.
(2) Drilled in 7 in. rows.
(3) Drilled through a new-type coulter.

In general it can be said that the results in dry weather indicate that either form of drilling gave a quicker establishment and more vigorous early growth than broadcasting. The new-type coulter area gave a better distribution of plants than the ordinary drilled area and would appear to be a useful method of sowing pastures on areas subject to prolonged drought.

The establishment of plants for a white-clover trial was completed during January, and at the present time a good coverage of the ground has resulted and a preliminary defoliating cut has already been made. In this trial white clover is being used as the indicator plant and a pure stand is now established. It was noted during the establishment of these white-clover plants that, although the whole of the 16,000 plants originated from a single plant, there was considerable variation in the form of growth during the earlier stages of establishment. Indications to date are that these variations become less apparent with the ageing of the clover plants. Preparations are now in hand for the application of fertilizers.

Provision has now been made for the establishment of two plots upon which investigations to responses to nitrogenous fertilizers will be carried out, and also fundamental investigations on the soil nitrate status of the plots with and without treatments. One of these plots is located in the field adjoining the white-clover plot and is situated on a typical area of the Hamilton clay loam. The other plot is situated on the flat at the back of the Station on the Te Kowhai silt loam.

Work has been commenced on the pilot trial using sheep to indicate pasture production. A total of 62 sheep were purchased, but a certain number of these will have to be excluded from the trial on account of too much variation from the type required.

A similar area adjoining the white-clover plot has been established with various types of agricultural crop plants and vegetables in an endeavour to obtain material for tissue testing and to induce the symptoms of various mineral deficiencies.

A further area has been fenced off from the remainder of the Station where a nursery of various types of weed plants is being established on which various weedicides can be tried out.

The removal of the glasshouse and other materials from Ruakura and its erection on this Station has made possible the large amount of plant propagational work which has been carried out here in the course of the last few months. In addition to

supplying plants for the establishment of the white-clover trial here, some 4,000 clover plants were sent to the Marton Experimental Area for the establishment of a trial employing the white-clover technique. At the present time a further 16,000 plants are being produced from one original plant received from the Plant Research Bureau, Palmerston North. This plant bears a distinctive red marking which should make it relatively easy to keep clear of other types of clover.

General Work.—Although many small jobs have had to be attended to since commencing the Station's activities, several major operations have been started. A considerable amount of fencing has been erected, but the completion of this awaits the supply of suitable fencing-wire. A start has been made in the felling and removal of trees behind the homestead. Plans have been drafted for the erection of a new set of farm buildings which will replace those at present on the Station and allow of the consolidation of all activities in one building. It is hoped that a start in the erection of the new farm buildings will be made within the next two months.

Estimation of Available Plant-food

Methods of estimating available plant-food are being tested on a variety of soil types with a view to finding that most reliable for use in advisory work. The Mitscherlich pot-culture method is selected as a standard for comparison. Among methods in course of investigation are the Neubauer seedling method, Dyer's citric-acid extract, the Egner lactate extract, various extractants of Bray, and the methods of Burd and Murphy.

At the experimental area of the Soil Fertility Research Station soil treatments cover a very wide range of phosphatic dressings. The available phosphate in representative samples has been estimated by a variety of methods. These differ considerably in their estimate of the order of fertility. Results will be correlated against growth in pot culture.

Serpentine-superphosphate.—The response of oats to serpentine-superphosphate and a number of phosphatic compounds on Egmont brown sandy loam, a soil particularly responsive to serpentine-superphosphate, is being determined in pot cultures with a view to finding where the particular advantage of serpentine-superphosphate lies.

Minor Element Experiments.—A preliminary experiment on permanent pasture with lime and molybdenum combinations has shown a response to molybdenum on Okaihau gravel loam. A more comprehensive experiment is in the course of being laid down, and also one with other minor elements.

Observational molybdenum strips on ten Waikato soil types have shown little response. A small preliminary trial has been started in a lucerne paddock in the Bay of Plenty.

A positive effect of molybdenum on yield of oats in pot experiments was demonstrated in the case of Hamilton clay loam and Egmont brown sandy loam.

Lime Requirement of Soils.—There is an urgent need for increasing the practice of liming in New Zealand and using the limited supply available to best advantage. Soil analysis can play an important part here, for the lime status of a soil can be very clearly revealed by chemical methods. The laboratory staff is at present being built up to deal with a great volume of samples. A field test has been elaborated which should be capable of giving reliable results in the hands of field officers. A limited number of outfits are being issued at the moment, but, contingent upon favourable results, the service will be extended.

A method of assessing the rate of reaction of various limestones has been further developed and should prove useful.

Quick-test Methods.—Following on from an investigation into sap analysis as a method of detecting mineral deficiencies, more rapid plant-tissue tests, notably the Purdue methods, have been tried out in the Bay of Plenty and Waikato districts. These methods are regarded as having considerable value.

Work on soil quick tests is also to hand. Laboratory techniques are being speeded up to reduce the time factor.

Advisory Analytical Services

As in previous years, about 1,000 samples were received by the laboratory during the year, and, although some delay has occurred due to the removal from Wellington to Hamilton, the analyses, apart from soil samples, are well up to date.

Soils.—A large number of samples taken at the Station are now being analysed completely so that a clear picture of the fertility of the experimental area can be formed.

The correlation between observational trials and soil analysis is to be checked by analysis of samples from selected trials from each area. The samples are stored and analysis will proceed as soon as time permits.

The movement of salt in the Ahuriri Lagoon area is being kept under observation and 41 samples were examined during the year. Advice has been given on 33 soils tested for lime requirement.

Fertilizers.—Out of 22 official samples received, 3 failed to conform with the analysis stated on the invoice certificate supplied.

In order that field trials may start on as sound a basis as possible, it has been decided to analyse samples of all fertilizers used. The value of the procedure is demonstrated in the case of serpentine-superphosphates, which are sometimes not correctly made and are therefore useless for trial purposes. Also, in the transfer of materials from one control to another, confusion can arise as to the nature of a fertilizer. Potash salts and nitrogenous fertilizers have been sent in completely mislabelled.

A small number of samples of fused phosphatic fertilizer were analysed in connection with research into producing a satisfactory product.

Limestones.—A large number of commercial ground limestones as well as samples of rock were received during the year. It is desirable that more use be made of lime-testers where these sets are available and that some of the samples tested be sent for check analysis by standard laboratory methods. In general, more frequent testing of commercial limestone is desirable to ensure that a satisfactory product is being marketed, since the quality of rock quarried can be very varied.

As in the case of fertilizers, liming-materials used in field trials are being examined.

Two samples of burnt lime were analysed and found to contain about 20 per cent. of active burnt lime together with about 60 per cent. of carbonate. This is in accord with the generally poor quality of burnt lime sold for agricultural purposes.

Pastures.—Dry-matter determinations on samples from experimental areas were done on 469 samples. Some of these will be analysed for mineral content when opportunity offers.

Weedicides.—The strength of 7 commercial weedicides was determined for the purposes of the weed-eradication experiments. With the introduction of new hormonal types of weedicides under varied trade names, experimental work will be necessary to determine the nature of commercial products and to check the strength of sprays used.

Miscellaneous samples included 6 samples of volcanic ash from the district round Ruapehu. The ash was deposited over a considerable area, but it was found to be relatively insoluble, containing nothing toxic to plant growth.

Summary of Samples :—

Soils	357
Fertilizers	99
Limestones	124
Pastures	469
Miscellaneous	40
Total	1,089

Chemical Weed Control

Studies in chemical weed-control methods were commenced in May, 1945. The following months were spent in acquiring data relating to previous local work and subsequent overseas developments. In the course of this work many papers have been studied and abstracted and a fairly comprehensive index system of references has been instituted.

In August plans for herbicide trials on ragwort were drawn up. Inability to secure a suitable ragwort-infested area and delay in the arrival of materials resulted in considerable modification of the proposed programme. A start was made in December on an area in Awatere Avenue, No. 1 Bridge, where a fairly extensive stand of ragwort existed. Much of the area was also infested with blackberry, making it possible to conduct trials with this weed concurrently with those on ragwort. Certain disadvantages in the choice of this type of infestation became apparent with the need for the expenditure of much time in the manual control of blackberry. The presence of many other weeds and of a few plants of gorse on the area was also availed of in carrying-out the trials.

The plots are located on an area of very light sandy loam. The prolonged drought and exceptional temperatures produced conditions unsuitable for growth, and the value of the interim results so far secured from the various treatments is therefore open to question. Restricted stocks of certain herbicides have been conserved pending the advent of autumn rains and a resumption of plant growth.

Work has not proceeded far enough to furnish any detailed reports, but these will be published in due course.

A number of trips have been made through local districts and to Rotorua and Te Kuiti to investigate weed conditions. The Railways Department's weed train was accompanied from Frankton to Cambridge and to Te Aroha.

Cape tulip, poa aquatica, nassella tussock, and kikuyu grass infestations have received special study, and a comprehensive kikuyu grass eradication trial has been established at Dargaville in collaboration with the Instructor in Agriculture.

Not the least valuable outcome of the year's operations is the practical experience gained in the planning, laying-down, and conduct of these field trials; much has been learnt which will be invaluable in conducting future operations. Due largely to the novelty of the work and to conditions during these early stages in the development of the Station, the year has been one of strenuous but intensely interesting work.

FERTILIZERS

Rationing.—The rationing of phosphatic fertilizers was continued during the year with certain modifications in the basis of allocation. For top-dressing, the allowance of 1 cwt. of superphosphate or its equivalent per dairy cow milked was discontinued and the percentage of allowance of the quantities used in the two base years ended 31st May, 1941, was increased from 28 per cent. to 42 per cent.

The allowance for such crops as wheat, root, and fodder crops was increased and fertilizer was available for sowing down to grass. Additional quantities were granted as a result of reopening the appeal procedure, and returned servicemen have again procured supplies as recommended by the district Fertilizer Committees of the National Council of Primary Production.

Importations.—For the fertilizer year July, 1945, to June, 1946, the imports of phosphate rock are scheduled to be 50,000 tons more than for the previous twelve months. Supplies from Nauru and Ocean Islands are expected to begin from July, 1946, but it will be several years before the pre-war tonnages from these sources are procurable.

Importation of limited quantities of nitrogen and potassic fertilizers continued.

Serpentine Development.—Work on the locating and reporting on deposits of serpentine rock in New Zealand was continued. The North Island superphosphate companies have installed suitable plant to dry and grind serpentine and to manufacture serpentine-superphosphate on a substantial scale. This should enable a good supply of a satisfactory product to be made available to farmers. To date over 500,000 tons of serpentine-superphosphate have been used on Dominion farms, and its use in the post-war period is likely to continue on a large scale.

Clarendon Phosphate.—During the year the quarrying of the high-grade phosphate rock by the British Phosphate Commissioners closed because further suitable supplies were not procurable.

The large-scale operations concerned with quarrying and grinding the low-grade phosphate also closed down. One company is continuing small-scale operations in the area.

Organic Fertilizer.—The Organic Fertilizer Control Order, which directed the use of organic fertilizer as a first priority for market-garden crops, was not renewed after 31st December, 1945, as, with the end of the war, the large-scale vegetable-growing operations previously needed were no longer necessary.

Official Samples.—During the year official samples of fertilizers have been taken and analysed, also a number of samples of limestone and ground limestone. Materials thought to have some manurial value have also been analysed and reported on. Consideration is being given to overhauling the Fertilizer Act to bring it into line with modern fertilizer trends.

Transport of Lime and Fertilizers.—The delivery of both lime and fertilizer ex-works to farmers is being retarded on account of the inability of the Railways Department to handle the total quantity being manufactured. To assist the position as far as fertilizers were concerned, arrangements were made to subsidize road transport up to one hundred miles from works in the Auckland district.

Nassella Tussock

Investigations into the control of nassella tussock in North Canterbury and Marlborough have been continued during the year, and a special inter-departmental committee was set up to go into the question of methods and action that should be taken to bring about the control of this weed. As a result of the report of this committee, legislation is being drafted with a view to giving the necessary powers to local bodies to take action to prevent the spread of the tussock and ultimately to bring it under control. In the meantime financial assistance is being granted the Nassella Tussock Committee in North Canterbury and the Marlborough County Council to enable those bodies to have work carried out to prevent the further spread of this weed.

Phormium Tenax

All figures are taken for the period 1st February, 1945, to 31st January, 1946. During the first part of the year, processing of green leaf into fibre for the manufacture of rope for the Armed Forces and tow for the manufacture of woolpacks, &c., was being maintained at full pressure, and mills were turning out sufficient fibre to meet the requirements of the rope-works. In October last the demand for fibre for war purposes ceased and from then on a considerable drop in fibre-production was noticed.

Production figures are shown below.

Production of Green Leaf.—Total quantity of green leaf cut, 27,450 tons.

Consumption of Fibre, &c.—The total amount of fibre, tow, stripper strips, and unscutched fibre (straw) produced was 4,835 tons, made up as follows :—

	Tons.
Fibre	2,886
Tow	460
Stripper strips	71
Unscutched fibre (straw)	1,418
	4,835

Mills operating.—The number of stripping-mills operating to date is 19, comprising 26 strippers. During the year all mills have been visited and the various aspects of the industry explained to millers and problems discussed. They have all expressed their thanks to the Department for the assistance rendered the industry.

Irrigation

In collaboration with the Public Works Department, special officers of the Fields Division are furthering the work of irrigation in Central Otago and Canterbury. During the war both Departments were engaged on work of a more urgent nature, but now that times are becoming more normal, attention is being centred on this important feature of farming in those districts of low rainfall.

Apart from the older schemes of Central Otago, more recent schemes are as follows :—

South Canterbury—

(*a*) The Redcliff Scheme, of 5,134 acres, which serves 18 properties and was completed in 1936. The source of water is the Waitaki River.

(*b*) The Levels Scheme, of 13,000 acres (approximately), serving 98 farms and completed in 1937. Water for this scheme comes from the Opihi River.

Mid-Canterbury—

(*a*) The Winchmore Scheme, of approximately 64,000 acres, serving some 160 properties and completed in 1944.

(*b*) The Mayfield-Hinds Scheme, of approximately 108,000 acres, to serve 270 farms and not yet completed.

Other contemplated schemes are Barhill, Tinwald, and the Rakaia-Dorie Schemes. Except for the Mayfield-Hinds Scheme, which it is understood will have a separate intake, the Mid-Canterbury schemes will be supplied by a main race from the Rangitata River which runs across the Ashburton County to the Rakaia River above Barhill. This race ends in a hydro-electric station. The source of supply for the Mayfield-Hinds Scheme is also the Rangitata River.

The Fields Division provides sound practical advice to those farmers who desire to use irrigation in the furtherance of efficient farming and production. It was recognized also that, since the State was spending large sums of money on these schemes, it was necessary to develop the potentiality as quickly as possible, and an endeavour was made in this direction, but always along the lines of sound advice and in consideration of the farmers' interests and in the interest of the land itself.

At the outset three officers of the Division were placed in each major Public Works Department construction camp so that they would become familiar with the schemes and the layout, gain some experience in levelling, and become known to the farmers and assist generally in the furtherance of the scheme. Unfortunately, the war interfered with the general plan, and with enlistment of officers and other activities occupying the Division it was necessary to curtail work in connection with irrigation development.

During the year under review there has been renewed activity on the part of the Fields Division. There are now six officers on irrigation work, and these men are in constant touch with Public Works Department irrigation officers and with farmers on the various schemes. One officer was sent to the United States to study irrigation as applied to farming in that country, and has returned ; his experience should be of great value in the efficient development of irrigation in Canterbury. The other officers are gaining experience with the development of the schemes.

Plans have been submitted covering the establishment of a research area, mixed farming demonstration area, and dairying experimental area. It is hoped that this work will be commenced during the coming year.

Flock House Farm of Instruction

The centre of training for lads desirous of receiving sound practical training in farming operations has been operated on more or less routine lines during the war, with 35 boys being trained each year. Now the war is over and as plant and farm materials become more freely available, a plan of extensive development will be embarked on with a view to stepping up the number of trainees that can be handled. It is also anticipated that a wider field of activities will be covered and more attention paid to individual training. The property will also be utilized to a much greater degree for experimental and demonstration work.

Sheep.—The flock comprised 5,330 ewes, 1,000 of which were two-tooths. Lambing percentage was 101 per cent. Breeding-ewes are being increased to 5,700. Fat lambs disposed of were 2,412.

Cattle.—Two hundred and eighty-five run cattle produced 232 calves, a percentage of 81. A total of 272 cattle was sold during the year, 120 of these being prime bullocks.

Dairy Herd.—The dairy herd of 100 head produced a total of 28,847 lb. of butterfat. Testing for tuberculosis was continued, there being two reactors, both of which were disposed of.

Pigs.—A total of 145 pigs was disposed of during the year. No carcasses were condemned for tuberculosis.

Cropping.—The usual crops of wheat, oats, peas, potatoes, sugar-beet, carrots, swedes, rape, and chou moellier were grown.

General.—The comprehensive scheme of flood protection has proved satisfactory, although no unduly heavy floods were experienced. Building maintenance has got in arrears during the war and considerable leeway will require to be made up over the next few years.

Young Farmers' Clubs

At this stage a review of the movement during the past few years is of interest. The pre-war total of 203 clubs, with a membership of 6,000, had fallen in 1943 to the low figure of 62 clubs, with a membership of less than 1,000. These latter figures are somewhat misleading, however, because, while there were nominally 62 clubs operating, in actual fact a number of them were comparatively inactive, many of them holding meetings at very infrequent intervals, and some merely holding an annual meeting for the election of officers. In spite of pressure both from without and within the movement to close down the whole organization for the period of the war, the optimism displayed by the few enthusiasts at this difficult time was, in the light of subsequent progress, fully justified. The forward movement commenced in 1944, when a better tone prevailed generally and prospects for the future appeared brighter.

By the close of 1944–45 a number of the old clubs in recess had resumed activities and a few new ones had been formed, bringing the total up to 104 clubs, with a membership of approximately 2,000.

To date there are 184 clubs functioning, with a membership approaching 5,000. The figures below, indicating the position of the clubs in the various Council areas, give interesting comparisons :—

Council.	Pre-war.	1943.	Present Date.
Otago-Southland	35	12	27
Canterbury	38	17	36
Wellington	77	18	61
Auckland	53	15	60
Totals	203	62	184

With the exception of certain districts, the movement is now very active throughout the Dominion, and there are excellent prospects for further progress during the coming season. Figures for the individual districts are illuminating :—

——	Clubs still in Recess.	Old Clubs Active (including recently Revived).	New Clubs.	Total Active.
Otago-Southland	18	17	10	27
Canterbury ..	17	21	15	36
Wellington ..	27	50	11	61
Auckland ..	21	31	29	60
Grand totals	83	119	65	184

The North Auckland districts present difficulties owing to shortage of Instructors to act as local organizers and district secretaries. Central Otago has always been difficult, even before the war, mainly on account of distances and sparse population. In Westland, although there is at present no Instructor in Agriculture, two clubs have been formed by correspondence. Rotorua is difficult on account of Maori population. Other districts, notably Eastern Southland, North Otago, South Canterbury, Christchurch, Horowhenua, South Taranaki, and Poverty Bay, appear to require some further organization to set them going; it is considered that a marked improvement will be shown in all these areas in the near future.

The figures in the table above gain further significance when it is realized that the revival of about 70 out of the 83 clubs still in recess is a probability during the coming season, and that in many districts the formation of additional new clubs is also anticipated.

The present policy, based on experience gained in pre-war years, is directed towards the formation of smaller clubs (with memberships of up to 30 or 40) covering in the aggregate wider areas, rather than the operation of a few large clubs (whose membership often becomes unwieldy) in each district. Some clubs with memberships round about 80 or 90 are considering dividing into two or even more clubs so as to cover the district more completely. This should increase total membership, assist in solving transport problems, and definitely give an added interest by ensuring that the majority of members become truly "active." The tendency in the past has been for the majority of members of the larger clubs to become a mere audience, and this, coupled with the low attendances on account of distances to be travelled, has considerably curbed activities.

Major activities are being renewed on a district scale, district field-days, stock-judging competitions, and debating contests having been revived in many areas. Steps are being taken to revive the stock-judging and debating on a Council and later a national scale.

The Federation has inaugurated a National Y.F.C. Memorial Scheme to commemorate those members who sacrificed their lives overseas; this memorial will be finalized at the annual general meeting of the Federation in June next. Information is being gathered to assist with the projected Y.F.C. Land-settlement Scheme, and, while there are many difficulties ahead, it is considered possible to work out some concrete method of assisting members desirous of taking up land. The Federation is also endeavouring to sponsor the formation of a "sister" movement for rural young women along similar lines to the Y.F.C. organization; so far the sympathy of the Women's Division and the Women's Institute has been obtained, and there are definite possibilities of such a movement being successfully launched.

From the above it would appear that, with the present organization and the prospects of increased staff, the Y.F.C. movement will go right ahead. In every district there is evidence of increasing interest, and it would seem to be mainly a matter of organization and planning to ensure the successful operation of the movement and its complete coverage over the whole of the Dominion.

DAIRY DIVISION

REPORT OF G. M. VALENTINE, ACTING-DIRECTOR

Climatic conditions throughout the Dominion varied considerably during the year under review, but, taken as a whole, the season was very disappointing from the production viewpoint. After a fairly wet spring in the North Auckland, Waikato, and Hawke's Bay – Wairarapa areas, dry conditions set in early in December and in North Auckland and the Waikato developed into one of the worst droughts experienced for many years. Owing to the rapid decline in production from January onward, most companies in the drought-affected areas found the daily collection of cream uneconomic and adopted an alternate-day collection early in February. As the hot weather continued, dairy herds lost condition rapidly because of the increasing scarcity of feed, with the result that many suppliers began to lose interest, and quality of both cream and butter was adversely affected. Feed in the Auckland Province became so scarce that in many cases hay and silage saved for winter feeding was used up and further supplies had to be obtained from other districts.

In Taranaki, the Manawatu, and the greater part of the South Island a fairly good season was experienced. Although the spring was wet and cold, there were no protracted spells of dry weather during the summer, and consequently production from these localities should be well up to previous seasons. In North Canterbury insufficient rain fell during the summer months to suit the district, with the result that production from this locality was below the normal expectation.

Output

As was to be expected from the climatic conditions, butter and cheese graded for export showed a decrease in quantity over the previous year. In terms of butterfat the decrease was 11,584 tons, or 8·47 per cent., over the 1944–45 figure, which showed an increase of 24,219 tons, or 21·52 per cent., over the 1943–44 figure.

Creamery butter received for grading for export during the year ended 31st March amounted to 107,582 tons, and cheese to 90,523 tons, as compared with 119,781 tons of butter and 94,140 tons of cheese for the preceding twelve months, a decrease of 12,199 tons of butter, or 10·18 per cent., and 3,617 tons of cheese, or 3·84 per cent.

Attention is again drawn to the fact that the figures used in this report are grading figures, not production figures, and, moreover, relate only to gradings for export. Although the gradings of butter for export show a decrease for the year under review, this would have been greater were it not for the rationing of butter for the local market to 6 oz. per capita per week. New Zealand's normal consumption, being approximately 13 oz. per capita per week, would obviously increase exports of butter in proportion to total production. The cancellation in November, 1945, of the contracts with the United States Joint Purchasing Board has also been responsible for the diversion to normal export of appreciable quantities of both butter and cheese.

Export Values

The total value, for Customs purposes, of all dairy-produce exported from the Dominion during the 1945–46 financial year was £30,519,302, an increase of £1,334,583 over the 1944–45 valuation of £29,184,719. The products included under this heading are butter, cheese, casein, dried milk, milk-sugar, and condensed milk and cream.

Taking butter and cheese separately, butter exported during the year was valued at £21,455,369 and cheese at £7,782,000. The values for the previous year were £18,754,698 and £9,643,013 respectively.

While these figures are interesting and useful as indicating the Customs valuation of dairy products exported during the year, it should not be overlooked that the quantities represented are actual shipments and therefore must not be related to the grading statistics included in this report.

Creamery Butter

The average grade of creamery butter graded during the year under review was 93·245 points, as compared with 93·402 points for 1944–45. Of the 107,582 tons received for grading, 86,373 tons, or 80·28 per cent., was classed as finest grade, 20,971 tons, or 19·49 per cent., as first grade, and 238 tons, or 0·22 per cent., as under first grade. The comparative percentages for 1944–45 were 84·72, 15·10, and 0·17, so that butter qualifying for the finest grade decreased by 4·44 per cent. while that in the first-grade class increased by 4·39 per cent., so that the percentage below first grade remained about the same.

As indicated by the average grade figures, butter quality generally was not quite so pleasing as for the previous season, especially for the months of January, February, and March, and in the Auckland Province, where the bulk of our butter is produced. The reason is to be found in the drought. Comparatively early in the new year, because of the consequential drop in production, herds were in many cases milked only once daily and cream collected less frequently, which combined with the hot weather, resulted in a poor-quality cream being produced and a very noticeable drop in butter quality.

In most of those districts not affected by the drought average quality was more satisfactory, though generally the cold and wet conditions during the spring resulted in the desired standard for premium butter being reached a little later than in average seasons.

Due to the absence of the usual flush of feed during the spring, feed flavours gave less trouble than is usually expected at this time of the year. Land-cress flavour, however, was reported from most districts of the North Island. Taken as a whole there was perhaps a little less trouble than usual from this source, though in some districts the trouble was fairly persistent and lasted later in the season than usual, due, no doubt, to weather and pasture conditions.

A new flavour which came to be known as "mountain ash" made its appearance in butter from several creameries situated in central North Island for varying periods during the eruptions of Mount Ruapehu. It seems to have been fairly definitely established that this ash had an effect on butter flavour which may have been through contamination of water or through being taken in with grass by stock grazing in the affected areas. Its presence created some difficulty in buttermaking between the periods of eruption until there were sufficient rains to wash the ash away. The investigational work carried out in connection with this mountain ash was not finalized by the time Mount Ruapehu became quiescent.

pH Testing of Butter.—This test is used to determine the relative acidity or alkalinity of the butter, and assists in discovering the addition of excessive neutralizer to cream. During the past year or two the tendency to over-neutralize the cream has revived, especially in certain districts. The resulting butter is more alkaline than it should be, and this can be easily determined by the "pH test." To ensure the reliability of this test a new set of pH colour charts has been prepared by Mr. G. C. Death, Assistant Chemist in the grading store at Auckland. The colours for these charts have been very carefully verified by a reliable electrical method applied to a series of samples, and the new charts should enable Instructors and Graders to check the excessive use of soda neutralizer. The number of pH tests made during the year at the various grading stores were: Auckland, 1,993; Gisborne, 60; New Plymouth, 859; Wanganui, 181; Wellington, 1,351; Lyttelton, 273; Dunedin, 126; Bluff, 24; a total of 4,867. The previous year's total was 4,097.

The bacteriological and chemical examination of butter was continued, the number of samples from the various grading stores being as follows: Auckland, 1,810; Gisborne, 209; New Plymouth, 732; Wanganui, 225; Wellington, 1,341; Lyttelton, 371; Dunedin, 21; a total of 4,709. The previous year's total was 4,664. All samples from ports other than Auckland were forwarded to the Dairy Laboratory at Wallaceville for examination.

Testing for Moisture and Salt.—Churnings of butter tested for moisture totalled 112,265, of which only 0·35 per cent. was found to exceed the legal limit of 16 per cent.

allowed by the Dairy Industry Act, and were returned to the companies for reworking to bring them within the legal requirement. Churnings tested during the previous year were 128,694, of which 0·27 per cent. was over-moisture.

Some 111,613 samples were tested for salt, of which 0·06 per cent. failed to comply with the regulations. For the previous year 127,082 samples were tested, 0·36 per cent. failing to comply with the regulations.

Butter for Local Trade and United States Joint Purchasing Board

In addition to patting butter required for local trade, the New Zealand Co-operative Dairy Co., Limited, and the Internal Marketing Division were engaged in packing supplies in 1 lb. pats and 5 lb. tins for the United States Joint Purchasing Board.

With the cessation of hostilities and the consequent cancelling of orders for the above, a considerable quantity of butter was in store and not required by the United States Joint Purchasing Board. The Export Marketing Department, however, was able to make satisfactory arrangements for its disposal overseas, and it has all been shipped.

Whey Butter

The quantity of whey butter graded showed a slight decrease, being 2,658 tons, as compared with 2,779 tons in 1944–45. Some 86·37 per cent. was classed as first grade, compared with 94·26 per cent. for the preceding year. Whey butter continues to be shipped to England, where the better qualities are used in blending to assist in maintaining the weekly ration. As will be noted from the figures, however, our whey butter generally is not very satisfactory, a large percentage being only second-grade quality. It would appear that the whey cream does not receive the attention necessary to produce a good-quality article.

Butter Processes

During the year processes for the production of butter from cream by the continuous method, some of them following practically similar lines to the New Way quick-freezing machine which has been passing through the developmental stages in recent years in Australia, have come into prominence in Europe. In others an almost instantaneous-beating process of churning and working has been used.

In order to keep in touch with these developments, Mr. F. H. Taylor, Senior Inspector of Dairy Products, London, visited Germany as a member of a committee which looked into the suitability of the new methods for adoption in the Dominion, and at a later stage visited Switzerland on a similar mission.

Mr. Taylor is keeping in close touch with these developments, and advises that, while it would be unwise to conclude that they will not eventually be suitable for use in New Zealand, there are a number of difficulties which must first be overcome before any steps should be taken to secure any of them for trials in this country.

It is worth noting that the Radiator, a separating process which produced butter by a continuous process was in use in the Auckland Province in 1902.

Cheese

The average grade of cheese graded for export during the year was 92·114 points, as compared with 92·121 points for the preceding year. Of the 90,523 tons received for grading, 22,930 tons, or 25·33 per cent., was graded as finest grade, 63,223 tons, or 69·84 per cent., as first grade, and 4,370 tons, or 4·82 per cent., as under first grade. The comparative percentages for 1944–45 were 25·94, 69·71, and 4·34.

Mr. W. Crawford, Superintendent of Cheese Instruction, reports that cheese quality was well maintained throughout the season, though this would apply more particularly to the South Island, Wairarapa, Taranaki, and the Manawatu. In the Waikato the quality was not so pleasing, many lines failing to reach the first-grade class.

With the exception of some of the factories in Canterbury and Otago where mixed strain starters are in use, single-strain starters are used at practically all the cheese-factories throughout the Dominion, being run mainly on the rotational system. Some managers have sufficient confidence in this system to run single-strain starters alone, but in most cases two single-strain starters are used together in the vats.

In South Taranaki Mr. L. J. F. Jones, the Cheese Instructor for that district, has been experimenting with an apparatus for the protection of the cultures and bulk starter milk from contamination by phage. This equipment has been installed for some months at a number of factories in South Taranaki and preliminary experience has yielded satisfactory results. At the same time, it is worthy of note that comparatively little trouble has been experienced this season with any recommended system, especially since the spring.

Quite a few curing-rooms throughout the Dominion are equipped with temperature and humidity control, and this is no doubt the ideal method for curing cheese, provided the cheese and shelves are given the necessary attention.

Although the shortage of labour in cheese-factories was not so acute as in previous seasons, the class of labour offering has, in many instances, not been satisfactory. This was indicated by the way the work was carried out in a number of factories, and it seemed evident that many of the men employed were not interested in their work. Although hours and wages are very much better than they were a few years ago, accommodation and living conditions will have to be made more attractive before the right class of young man will be induced to take up cheese-factory work as a career. The finish of some of the cheese, particularly in South Taranaki, was far from satisfactory, and in most cases could be attributed to the unsuitable labour which had to be employed.

Special Project: Cheshire-type Cheese

During the year a suggestion which originated with the London Manager of the Marketing Department and was supported by the Dairy Division's London office was received from the Marketing Department (Export Division) to the effect that, owing to the possible continued reduction in the manufacture of Cheshire cheese in Britain, New Zealand should endeavour to manufacture cheese of this type for marketing in the areas in England where Cheshire cheese is in greatest demand. It was thought also that the diversification of type would in future years assist in creating a wider demand for cheese, especially when the existing condition of shortages no longer obtained.

The Dairy Research Institute at Palmerston North and the Dalefield Dairy Co. have co-operated fully in an endeavour to develop a cheese of Cheshire type, and a number of experimental consignments have already been forwarded to Britain. Results so far obtained, while not entirely unsatisfactory, indicate that further trials are necessary in order to develop the correct technique, as applied to New Zealand milk, to give a type of cheese which will satisfy the requirements of this particular trade.

Arrangements are being made accordingly to continue this work during the 1946–47 dairy season.

Dairy-produce Grading

The following extracts from the report of Mr. E. C. Wood, Superintendent of Dairy-produce Grading, provide a useful overall picture of this branch of the Division's work:—

Cheese.—At the various ports, other than Auckland, the quality of cheese inspected was generally of a uniform nature, bodies and flavour being satisfactory, and the main task of the Graders was to decide whether the texture was sufficiently close to allow of the cheese being classed as finest grade.

The Graders were using sound judgment, and a comparison of the grade points allotted during my presence with those previously given for similar quality further indicated that the Graders were working on the right lines. The lower fat content of Southland cheese creates a slight difference in cheese body compared with the higher-testing milk in the North Island, but, nevertheless, the uniformity of the bodies seen at Bluff was very creditable to the cheesemakers and the Dairy Instructor.

Many of my annual reports while Grader in Charge at Auckland have referred to the irregularity in the quality of cheese graded at this port. Such irregularity has been mainly due to starter failure or faulty milk. During my visits to other centres I have never seen cheese approaching the quality of some of the low-quality produce received frequently in Auckland. As a result of the recent drought, cheese manufactured at factories which usually are the highest scoring at Auckland has been quite abnormal, the bodies being soft and pasty.

One matter which has impressed me with regard to cheese quality has been the very satisfactory flavours in cheese made in various provinces from unpasteurized milk, and it would only be fair to suggest that credit should be given to farm dairy instruction for this great improvement.

Creamery Butter.—With the exception of several brands graded for export at Lyttelton, a good deal of the South Island butter was found to be of mediocre quality, and the Graders at Timaru, Dunedin, and Bluff are somewhat handicapped in not having at least some choice quality for standard purposes.

Wellington and New Plymouth returns indicate a slight decline in butter quality. Butter handled at Auckland has been severely affected both in quantity and quality by the long period of very dry weather, and it is doubtful whether the Auckland Province has ever experienced such a disastrous season.

Whey Butter.—The best-quality whey butter manufactured in the Dominion is produced at most of the Taranaki cheese-factories. Wellington quality has been irregular, and occasionally colour defects were evident there as well as at Bluff. The quality of Auckland whey butter is poor and although efforts have been made to bring about an improvement, results have been disappointing. The abnormal season, however, must be taken into consideration.

Analytical Work.—At my suggestion a few improvements have been carried out at some centres toward ensuring correct testing results. These matters include cleaner test bottles, more suitable bottles for holding butter samples, and provision against undue evaporation in butter samples prior to testing.

Packing of Butter and Cheese.—The red-beech timber used by Southland dairy companies provides a splendid cheese-crate, while much of the *Pinus insignis* used in the North Island is also quite serviceable. As a contrast, some of the New Zealand Co-operative Dairy Co.'s crate timber has been cut from either immature exotic timber or timber that has been denatured, and is easily damaged. The use of brittle rimu and matai battens in South Taranaki resulted in many breakages by the time cheese from Patea reached Wellington and necessitated a large amount of repair work before the crates could be loaded on the overseas vessels. The outstanding feature with respect to butter packages at grading is surface taint on butter packed in cartons. The glue used for sealing cartons has a very pungent odour, but I believe that if parchfoil wrapping was again available surface flavour and high colour would largely be reduced.

An improvement in the application of creamery numbers and brands on cartons used elsewhere than at Auckland is warranted for the sake of appearance and clear identification, and there is a lack of uniformity in the manner of grade-stamping carried out at practically all stores other than Auckland.

Cool-store Facilities.—At New Plymouth and Bluff there is no suitable accommodation for weight checking cheese, this work being carried out on narrow platforms adjacent to the wagons being discharged. Wellington, Patea, and the smaller ports have the best facilities in this respect, and several lots can be inspected and weighed at the same time. While the Grader's work at Patea entails inconvenience and much labouring work in shifting the top tier in trucks when sampling cheese, conditions in this respect are generally superior to those obtaining at New Plymouth. At Auckland and the small ports all sampling is carried out in the cheese-chambers, with comparative convenience to the Graders.

Storage temperatures appear to be well controlled at all stores, but suitable humidity control is lacking at New Plymouth and Patea. At Bluff stores sulphur is burnt to check mould growth, and an inspection of all chambers on the occasion of my last visit indicated that as far as could be seen the cheeses were in splendid condition, but according to the Shipping Inspector, who was present at a recent load-out, there was considerable mould dust in circulation when cheeses were removed from the centre of the stacks, the sulphur fumes protecting only the exposed crates.

Through stress of weather or an unworkable bar, coastal vessels loaded with cheese are at times held up at Patea and no provision is made to prevent rising temperature within the holds. The storage company's management has been advised to meet the position, in order to protect the quality and condition of the cheese, by circulating cold air by means of a canvas hose, and it remains to be seen whether this suggestion will be carried out.

Butter storage is apparently quite satisfactory at all stores, although there have been a few instances of high temperature at time of shipment in Auckland.

Facilities for grading butter at all stores, with the possible exception of Bluff, where the room is devoid of sufficient daylight, are quite satisfactory.

Examination of Stored Butter.—I had an opportunity of examining about 40 representative boxes of creamery butter which had been stored at Wellington and New Plymouth for approximately four months. At both ports the butter had held up very satisfactorily, the maximum drop from the original score being 1 point in three boxes at each port. The regrading points indicated that the original scoring was sound.

Farm Dairy Instruction

The farm dairy instruction service has operated at full staff strength during most of the year under review. While, during the later months of the financial year, a slightly increased petrol allowance for this work was possible, the service was still limited to a certain extent by the need for petrol conservation. Nevertheless, most Farm Dairy Instructors accomplished much in the way of shed improvements and the general layout of yards and surroundings.

For some time, however, it has been apparent that the percentage of unclean dairies in a number of districts is far too high and a much stricter standard of inspection is required. Mr. W. G. Batt, Special Inspector, Hamilton, who, early in 1945, in company with local Dairy Instructors and Farm Dairy Instructors, checked up on standards being followed, extended his tour of inspection to the South Island. In this visit he was accompanied by the Assistant Director of the Division. Meetings with Farm Dairy Instructors were held at various centres and the information imparted was helpful and instructive. A conference of Supervising Officers held in Palmerston North during May, 1945, at which discussions and exchange of ideas relative to farm dairy instruction took place, also assisted to put the work on a better footing. To effect the desired improvement, however, some Instructors may need further tuition, and it also appears that the service may not be wholly effective until additional Special Inspectors and also a Supervisor of Farm Dairy Instruction are appointed, thereby ensuring closer and more adequate supervision.

In the course of their duties Farm Dairy Instructors made 102,144 visits of inspection, instruction, and advice to farm dairies during the year, representing an average of about 1,350 visits per officer. In respect of milking-sheds, 33·6 per cent. were classified as good, 51·7 per cent. as fair, and 14·6 per cent. as bad. The classification percentages for milking-machines were 40·1, 41·5, and 18·3 per cent. respectively. These figures make it quite clear that there is considerable room for improvement in the condition of both sheds and machines.

The number of new milking-sheds erected during the year was 836, while the number substantially reconstructed was 898, compared with 777 and 874 respectively in 1944–45.

The amount of repair and renovation work carried out last winter was to some extent limited by the availability of cement. The dairy industry, however, was very fairly treated, being placed relatively high on the priority list. Farm Dairy Instructors were able to see that such quantities as could be made available were used to the best advantage by making recommendations for releases in accordance with the urgency of the work requiring to be done.

Grading of Milk and Cream

Grading of milk by the curd test has been carried out satisfactorily at the majority of cheese-factories throughout the Dominion. The Superintendent of Cheese Instruction reports, however, that certain factories were not always carrying out daily milk grading, thus making it necessary to issue a warning regarding compliance with the regulations. With the exception of the Waikato, the methylene-blue test was being carried out satisfactorily in all districts. In the Waikato, however, this test appeared to be done only spasmodically in some cases, and apparently the managers concerned did not realize that the reductase test had to be done every day. Here, again, attention was drawn to the provisions of the regulations.

The Superintendent of Butter Instruction, in reporting on cream grading, also draws attention to the fact that the grading is carried out satisfactorily in all districts except the Waikato, where, because of the absence of zoning, competition for supply is most keen between dairy companies operating over the same territory. To attract supply in such cases the tendency is to adopt a more lenient standard of grading, which is the cause of the majority of grading complaints. For the purpose of uniformity and to ensure that cream is classified according to quality, Dairy Instructors make frequent checks throughout each season at all creameries. Advantage is also taken on these occasions to stress the importance of impartial grading if the confidence of suppliers is

to be retained and the quality of our butter improved to the extent that it will more than hold its own in competition with other countries. Moreover, realizing that butter can only be as good as the cream from which it is made, the importance of a sound grading standard cannot be too strongly emphasized.

Milking-machines and Separators

During the year 1,165 new and 917 used milking-machines, making a total of 2,082 machines, were installed. In addition, 82 permits were issued for the installation of farm separators.

With regard to this last figure, however, it should be mentioned that the arrangement requiring a permit from an authorized officer of the Division prior to the installation of a separator was withdrawn during the year because of the improved supply position. The figure given, therefore, cannot be accepted as indicative of the number of new farm separators installed.

Check-testing of Milk and Cream Samples

This work was continued as part of the routine duties of Dairy Instructors and Special Instructors. During the year these officers checked the factory testing at 482 visits, and during these visits checked 2,980 samples. The work appeared to be carried out accurately and conscientiously in the great majority of cases, though there were some instances where it was found necessary to issue a warning in regard to compliance with the regulations.

Control of Supply

For the fifth season in succession it has been necessary to exercise some control over the supply of milk and cream to dairy factories in order to meet the wishes of the British Ministry of Food regarding the quantities of butter and cheese required to meet the rationing of butter and cheese in the United Kingdom.

As it was indicated that butter-production must take priority over cheese, the Dairy Supply Control Order 1945, was made, which permitted cheese-suppliers to change over to butter, but tied butter-suppliers to a creamery. The revocation of the Transport Control Regulations, however, now permits a change of supply from one creamery to another in the normal winter period, providing there are no restrictions under the heading of "zoning of supply" by the Executive Commission of Agriculture.

The great majority of the suppliers affected accepted the general direction tying them to butter, but some had to be personally directed to do so. Legal action was successfully taken against one supplier to ensure compliance with the Order, and four others are still pending.

Redundant Cheese Plant

The list value of cheese plant rendered redundant at the time of the reversion to butter in 1942 was £64,000. The original basis of sale was a reduction of 7½ per cent. on the list price, but more recently it has been found necessary to lower selling prices to a much greater extent, which will result in a substantial loss on a number of items, particularly those for which the demand is less active.

The list value of plant sold during the year totalled £12,400, and the value of unsold plant at 31st March was £16,700. Net realizations to date indicate a loss of approximately £16,000. To give greater publicity to this plant, arrangements were recently made with the National Dairy Association, the principal selling agents, to circulate a printed list of unsold plant among all dairy-factory managers in the Dominion.

Inspection of New Zealand Dairy-produce in Britain

Mr. F. H. Taylor, stationed in London, and his assistant, Mr. G. V. Were, stationed in Liverpool, have continued to carry out the inspection of New Zealand dairy-produce in Britain, and also to perform many other duties connected with the marketing, distribution, and technical aspects of the dairy industry as affecting this Dominion. During the war the London officers of the Dairy Division have been actively associated with the

British Ministry of Food. Although diminishing in extent, this association still continues, and it is pleasing to know that the experience and expert ability of those officers have been of considerable benefit to the Ministry in the administration of a major and difficult problem. The period of transition through which we are now passing is a particularly important one from the point of view of the future of our dairy industry, and for this reason fairly full extracts from the reports of these officers are considered worthy of record.

Mr. Taylor reports in part as follows :—

During the war period, as a safety measure against loss of stocks, foodstuffs were distributed as rapidly as possible from shipping centres to widely scattered areas, so that Tooley Street, as the emporium of New Zealand butter and cheese, has been practically deserted. The dispersal of the produce direct from ships to warehouses, where it is often stowed ceiling high, and the non-segregation of brands have made it impossible to examine and report on all shipments of cheese arriving. Generally, cheese inspections have been fitted in with the Ministry of Food's Area Officer when he makes his report upon the storage condition of his stocks of cheese. This involves unstacking and uncrating a number of cheeses and examining the crowns and the general exterior condition of the produce. There is, of course, some expense involved in this procedure, but at the present stage this is being borne by the Ministry of Food.

The old routine is still in force with regard to butter examinations, save that the shipments arriving at Hay's Wharf cool stores in London are very much smaller and at less frequent intervals. However, once the food situation gets more normal and supplies are not required with such urgency as at present, it is likely that butter at least will be returning to the more regular cold stores.

From all quarters one is told of the satisfactory condition of our produce, but one must accept this with some reserve, as there is the factor of comparison with a quantity of rather inferior produce.

Southern Hemisphere butters have been the mainstay of the butter ration in this country for the war period, but it is difficult for the general public to know the country of origin. The man in the street is not fully aware of the fact that he owes very much of the quality of his issue to Australia and New Zealand. Some of our butter is, in my judgment, lacking in character—clean, but neutral. Immediate competition for our choicest full-flavoured butters is not likely, but it will come with the unrestricted sales of margarine and Continental butters.

Several shipments of oil-tainted butter have reached this country during the past two years, and the question is causing some concern to shipowners.

The activities of the British Standards Institute, which eased off considerably during the war, have now been revived, and whenever possible I endeavour to attend their meetings, which average one or two a week.

Close contact is kept between this office and the London office of the Marketing Department. Meetings have been attended with Mr. H. E. Davis in relation to the British Food Labelling Order and considerable data collected in regard to vitamin content of dairy-produce, &c.

Meetings of the Society of Dairy Technology have been attended, where various aspects of the dairy industry in this country are discussed.

During the year I made several visits to dairy factories and institutes where Cheshire cheese was being manufactured, in order to forward details of the process to New Zealand.

In addition, in company with scientists, I made visits to Germany and Switzerland to investigate new methods of manufacturing butter by more or less continuous processes. As the result of these visits, some most valuable contacts have been made in Europe, and some old ones renewed. Regarding these new buttermaking processes, it appears that they may be here to stay, and experiments are being carried out in several Continental countries.

The following paragraphs are taken from Mr. Were's report : —

Creamery Butter.—Quality on inspection soon after arrival has been found to be sound, and rarely do we find a sample which has depreciated to a lower category than that indicated by grade stamp on package. In describing New Zealand butter as "sound," it is not meant that much of it cannot be improved. The flavour of our butter is often lacking in that character which would cause us to describe it in superlative terms. The flavour of many brands may be described as "rather flat" or "inclined insipid." It is suggested that this lack of character may be due to over-neutralizing the cream from which this butter is made.

Whey Butter.—The quality of much of this commodity has been disappointing, and it is felt that more team work between directors, managers, and Dairy Instructors would greatly improve the standard of quality. When whey butter was used solely for manufacturing purposes a high standard of quality was of less importance than now, when Grade 1 is mixed with creamery butter for table use.

Cheese.—Average quality may be described as sound. Flavours are sometimes found to be a little irregular, but, on the whole, they are remarkably uniform as compared with cheese flavours from other countries.

Body and texture are good. In my judgment, our cheese was never better than that which has arrived here during the past year, and I believe that the provision trade would endorse this statement.

The prestige of New Zealand dairy products is at present high in Britain; this may not be due as much to the excellence of our produce as to the irregular quality received here from other countries.

Packages.—A well-seasoned white-pine butter-box is still regarded as the best container for butter arriving in this country from any source. Our best fibre cartons and Saranac package may be described as reasonably good substitutes for the white-pine box. The Saranac package constructed with wooden ends and fibre surround is preferred by packers and blenders to the fibre carton on account of its more robust stability, which makes it more useful for repacking with pat butter.

Dairy Factory Managers' Registration Board

For some years the number of new applications for registration has remained fairly constant at between 40 and 50 a year. The number dealt with by the Board during the year under review totalled 44, certificates being granted in 34 cases. There are at present 731 holders of certificates on the register, 246 being creamery managers' certificates, 410 cheese-factory managers' certificates, 3 with first-class cheese and second-class butter, 3 with first-class butter and second-class cheese, while 69 hold first-class certificates for both butter and cheese.

Reference is made elsewhere in this report to the fact that during the later war years much of the labour available in dairy factories has been unsatisfactory. There has also been an increasing movement of good personnel away from the factories. With the object of assisting returned servicemen desiring to take up dairy-factory work, and also to ascertain how the work can be made sufficiently attractive to encourage men of the right type to enter dairy factories as a career, the position is being very fully considered by a committee comprised of representatives of the Dairy Board and of the Dairy Factory Managers' Registration Board. Investigations so far made appear to indicate that the main causes of dissatisfaction may be linked with lack of suitable housing, the fact that for many assistants the work is only seasonal, the lack of good prospects, the lack of superannuation, and the lack of financial assistance to pursue studies and obtain the diploma qualifications essential to advancement under present-day conditions.

The committee is well advanced with its work and expects shortly to make recommendations to the appropriate authorities.

Dairy Laboratory, Wallaceville

Chemical.— During the past year the number of chemical samples dealt with increased by about 200 to nearly 900. The majority of these were samples of butter which were analysed for copper and iron content, as minute traces of these metals may stimulate the development of undesirable oxidized flavours, especially if the butter is stored too long or under adverse conditions. To supplement these analyses and to enable Dairy Instructors to track down the source in the factories of undesirable metallic contamination, similar analyses have been done on cream samples (including the respective buttermilks yielded on churning). The number of these particular samples is rather fewer than were done the previous season, but more replicate analyses have been done on them to improve the reliability of the methods used. The results of this work have shown that a great deal of creamery butter is made without undue metallic contamination, but whey butter is often defective in this respect. In many cases whey cream contains more copper and especially iron than it should. Although the whey butter forms a very small proportion of the total manufactured, it is now required to supplement the meagre butter rations available in Britain, and increased efforts are desirable to improve its quality by reducing metallic contamination to a minimum.

The number of chemical examinations of water samples from dairy factories is even lower than the small number dealt with during the previous year, but there have been an increased number of inquiries for analysis and advice about farm water-supplies, possibly due to drought conditions prevailing in certain districts. Many water-supplies are used in factories and farms without regard to their chemical defects, which sooner or later give rise to various troubles which involve expensive replacement of equipment. By more or less simple treatment based on chemical analysis, defective water-supplies could be often improved. Unfortunately, with the present staff it is quite impossible to deal adequately with this important matter.

During the summer of 1944 the assistance of the Dairy Chemist was asked for in connection with experiments on the preservation of butter-milk curd for pig-feeding. After preliminary observations a series of trials was begun at the pig-farm operated by the Public Works Department in conjunction with the Japanese prisoner camp at Featherston. These trials have been controlled by an extensive series of chemical analyses which have yielded some very useful information. No difficulty has been experienced in preserving buttermilk curd for several months, even when the conditions of storage have been varied somewhat. The method is essentially a cheesemaking process, although it differs appreciably from what is used in a cheese-factory. These trials will shortly be concluded, and as soon as possible a report will be prepared to provide the necessary information to farmers who may wish to store curd made from either buttermilk or skim-milk.

Bacteriological.—The total number of bacteriological samples shows a slight increase, and the great majority of these (3,400) were butter samples examined to provide the Instructors with an indication of the hygienic conditions in the factories.

Only very few water samples from dairy factories have been examined, but it is hoped when time permits to devote much more attention to a much-needed survey of this matter.

Unfortunately, only a very few starters from cheese-factories have been examined for bacterial contamination. In place of this work it was necessary to undertake the chemical analysis already mentioned in connection with curd-preserving trials.

In connection with town-milk supplies, the Central Milk Council requested the Dairy Chemist to be appointed to an advisory committee on town-milk quality, and this led to his services being asked for to make a survey of the laboratory facilities available in the four principal towns for systematic routine testing of town-milk supplies. To do this a considerable amount of time was taken up in visiting the four principal centres and in preparing a report.

Market Milk

Following the decision that the Dairy Division should assume control of market-milk treatment, plans are being formulated to set up a Market Milk Section of the Division. The objective is to provide for the market-milk trade, where milk for liquid consumption is treated, a service similar to that already in force in relation to the butter and cheese industry. This will necessitate a small increase in personnel at the commencement and a wider scope of duties for the existing butter and cheese instructional staff.

Certificate-of-record and Government Official Herd-testing

The testing service to breeders of pedigree dairy cattle has continued to receive increased support. In fact, the number of applications received has grown so rapidly that, because of the shortage of locomotion and suitable staff, it has been difficult to avoid declining acceptance of a number of entries. The staff position, however, shows signs of easing, and in recent months several additional Testing Officers have been appointed. Much credit is due to Farm Dairy Instructors, who, in their own time and often at some inconvenience, have during the war carried out the testing for a large number of breeders. A number of Farm Dairy Instructors are still doing testing-work, but as sufficient testing staff becomes available the work is gradually being taken out of their hands, though they will still be required to assist by carrying out the testing for breeders situated in isolated localities. There are at present four women Testing Officers on the staff and they are doing very satisfactory work.

First-class certificates of record issued during the calendar year 1945 numbered 798, as compared with 674 in 1944. In addition, 151 second-class certificates were issued. Of the cows which received first-class certificates, 484 were in the yearly division and the remaining 314 in the 305-day division, average production being 526·58 lb. and 440·60 lb.

respectively. Of the cows which received second-class certificates, 108 were in the yearly division and averaged 526·17 lb. fat, while the remaining 43, which were in the 305-day division, averaged 419·99 lb. fat.

The number of cows tested under Government O.H.T. showed a further substantial increase from 4,471 in 1944–45 to 6,129 in 1945–46. The 1943–44 figure was 3,184.

Future Planning

Now the war is over and the requirements of the future are beginning to become more clearly discernible, plans to meet essential development are gradually being put into effect.

A more effective farm dairy instruction service is proposed. This service was placed on a Dominion basis in 1938 and its further development was restricted by subsequent war conditions.

A further proposal is to extend the services of certificate-of-record and Government official herd-testing by requiring the testing of all sound pedigree cows in any herd entered for test, and by the introduction of proven sire surveys and lifetime production dam certificates.

Staff

Assistant Director.—Consequent upon the retirement of Mr. W. M. Singleton from the position of Director of the Dairy Division, and the appointment of Mr. G. M. Valentine as Acting-Director, Mr. H. A. Foy, on the 1st August, 1944, assumed the position of Assistant Director of the Dairy Division.

Secondment.—In September, 1944, Mr. J. A. Singleton, Dairy Factory Superintendent, Massey College, went to India on loan to the Government of Bengal for a term of one year in connection with improvement in the production of dairy products. In 1945, at the request of the Bengal Government, the term was extended for a further year. During Mr. Singleton's absence his work at Massey College is being carried on by Mr. S. J. Cowen, previously on the dairy-produce-grading staff at Wellington.

HORTICULTURE DIVISION

REPORT OF W. K. DALLAS, DIRECTOR

Climatic Conditions

From a fruitgrowing point of view the weather during the past year has been distinctly unfavourable. A dry spell, amounting to drought conditions, from late in October to early March in practically all provinces except Canterbury and Otago affected both production and the size of the fruit. In the northern districts apples were damaged by sun-scald.

Several hailstorms were again experienced this year in Canterbury; an especially severe one which occurred in the Loburn district in December rendered the greater portion of the apple and pear crops useless for marketing. During February heavy rain fell in the Cashmere area close to Christchurch, causing severe damage to glasshouses. Tomato and other vegetable crops suffered severely.

In Nelson a hailstorm early in November caused appreciable damage to orchards in the Lower Moutere area, but with a full crop set it was possible to thin off the severely damaged fruit, leaving almost a full crop, but of lower grade.

In Otago a normal winter and an early dry spring was followed by cold, wet conditions till January. The autumn has been quite good. Frosts in the Central Otago district were not as severe as in the previous season. There has been a great increase in the number of frost-fighting appliances installed, growers realizing that this is the best insurance possible against the loss of their crops.

A late frost just following the fruit-setting caused serious loss of crops in the Marlborough district. Stone-fruits were almost a complete loss, while pip-fruits were reduced by 30 per cent.

Area and Number of Orchards

For the year under review the number of orchards recorded in the official register was as follows:—

Taxable orchards (containing 120 and more trees)	2,151
Non-taxable orchards (less than 120 trees, but not including domestic orchards)	2,905
Total	5,056

This shows an increase of approximately 300 over the preceding year.

The total area devoted to pip, stone, and citrus fruit trees is approximately 18,200 acres, the areas (approximately) being utilized for commercial production of the principal kinds of fruit being as follows:—

	Acres.
Apples	10,000
Pears	1,000
Stone-fruit	5,000
Lemons	900
Other citrus	1,000
Other tree fruits	200
Total	18,100

The relative sizes of fruit orchards in New Zealand are:—

9	orchards	over 50	acres
57	,,	26–50	,,
43	,,	21–25	,,
107	,,	16–20	,,
237	,,	11–15	,,
562	,,	6–10	,,
1,136	,,	1–5	,,

2,151 orchards aggregating approximately 16,000 acres.

The average economic orchard unit is in the vicinity of 12 acres, but the size of such unit is dependent mainly on orchard-management practices and the fertility of the soil in which the trees are established.

Production

The quantity of fruit produced in the Dominion during the 1945 season was :—

	Bushels.
Apples	2,280,224½
Pears	363,637½
Stone-fruit	557,615
Lemons	97,875
Other citrus	69,770

Apples and Pears.—The total production of apples and pears was distributed as follows :—

	Apples.	Pears.	Total.
	Bushels.	Bushels.	Bushels.
Distributed to consumers by Internal Marketing Division	1,868,106½	275,746½	2,143,853
Sold privately by growers	190,622	36,498½	227,120½
Sold to canning factories	140,997	51,038	192,035
Sold for dehydration, pulping, cider, &c.	80,499	354½	80,853½
Total	2,280,224½	363,637½	2,643,862

Owing to unseasonable weather conditions, the quantity of apples produced during 1945, although slightly in excess of the estimate, was appreciably less than that of the previous season.

The latest estimates for the 1946 season indicate a crop of 2,452,435 bushel cases of apples and 266,865 of pears.

Citrus Fruit.—Estimated totals for citrus production for the season 1945-46 are :—

	Bushels.
Lemons	97,875
New Zealand grapefruit	61,220
Sweet oranges	8,390

Growers of citrus fruits in the northern parts of the Dominion suffered financially when drought conditions extending for a period of four to five months were experienced toward the end of 1945 and till early in 1946. Considerable losses occurred in the orange and lemon crops by the fruit falling in the early stages of growth. The trees also suffered badly, and many growers in the Kerikeri area were put to considerable expense in either installing in their orchards a system of irrigation or by carting water and applying it to the soil about the trees in order to keep them alive.

Stone-fruit.—The quantity of stone-fruit produced shows a decided increase over last season. This was especially the case in Central Otago with regard to apricots. In Gisborne, however, drought conditions caused an appreciable loss of fruit.

The estimated production of stone fruits for 1945–46 is :—

	Bushels.
Peaches	303,300
Nectarines	28,500
Apricots	97,800
Plums	114,965
Cherries	13,050

There is still a good demand for stone-fruits for consumption as fresh fruit and for processing. This has had the effect of increasing the areas planted in stone-fruit in suitable districts.

Standardization of Pip-fruits

Three standards embodied in the New-Zealand-grown Fruit Regulations 1940, and amendments thereto, are in operation—viz., Fancy, Commercial, and Minimum—and over the past three years' production an average annual percentage of 81 per cent. Fancy, 18 per cent. Commercial, and 1 per cent. Minimum has been maintained. The operation of standard grades for pip-fruits has proved of immense practical value to the producers, auctioneers, retailers, and consumers, and has simplified marketing considerably.

From observations made in the main fruit and produce markets of the Dominion it is evident that there is ample scope for improvement in the marketing of stone-fruits, small fruits, and vegetables by the introduction of standard grades for these products.

Fruit Cool Storage

The cool-storage space available throughout the Dominion has a capacity of 1,105,100 bushel cases, and is distributed as follows :—

	Public Cool Storage.	Growers' Private Cool Storage.	Total.
	Bushel Cases.	Bushel Cases.	Bushel Cases.
North Island	743,980	72,620	816,600
South Island	214,644	73,856	288,500
Totals	958,624	146,476	1,105,100

The stocks of pip-fruit held in cool store on 30th June, 1945, amounted to :—

	Bushel Cases.
Apples	628,347
Pears	101,538½
Total	729,885½

The quantity held in shed storage in orchards was 47,120 bushel cases of apples.

A number of stone-fruit growers in Central Otago have erected in their orchards small pre-cooling chambers ranging in capacity from 200 to 1,000 bushel cases, the total capacity of the stores being 4,500 cases. In the coming season a further increase in the number is contemplated, and several of the present store-owners are considering extensions to their plants.

During the year most of the fruit cool stores throughout the Dominion were visited by the Cool Storage Officer, and advice given in connection with improvements and alterations to the cooling systems and equipment.

Plant Nurseries

Throughout the Dominion for the year 660 nurseries were registered, an increase of 17 compared with the previous year. Each nursery has been inspected at least once during the year. Generally, they are being maintained in a satisfactory condition and reasonably free from disease.

The demand for ornamental trees, shrubs, forest trees for farm planting, and bedding-out plants has greatly increased in recent years. The present position is such that active, well-trained young men should be able to make a good living in meeting the demand for public and private tree-planting.

There is an ever-increasing demand for trained gardeners in the Dominion, due to the young men of the past fifteen years who might have been expected to take up the nursery trade as a profession having entered other trades offering better opportunities.

Cut Flowers

A considerable quantity and variety of cut flowers are grown throughout the Dominion for commercial purposes in private gardens and in commercially sized areas.

The use of cut flowers for presentation purposes is increasing. The demand for quality flowers in season presents opportunities for those able to arrange contracts with florists and others using large quantities regularly. There are also good prospects for those prepared to raise bulbs for sale (domestic and export), as well as growing for the blooms.

Orchard Instruction and Inspection Service

The return of officers from overseas has enabled more attention to be paid to instructional work in all branches of horticultural-crop production.

In addition to their usual advisory work, officers are called upon to collect data and statistics relating to the horticultural industries to provide sound information when problems are under discussion.

In conjunction with instruction, inspection of orchards has been undertaken. The great majority of commercial growers are maintaining their orchards in a satisfactory condition and reasonably free from pests and diseases.

In the course of the inspections many of the domestic orchards were found to have been somewhat neglected. The occupiers of the properties where disease was found have been instructed as to the control measures which should be applied and as to their responsibilities in this matter.

Special attention is being given to the requirements of ex-servicemen who have taken up orcharding as a career.

Diseases of Horticultural Crops

Following the cold, wet spring, fungous diseases were more evident than usual. Good control was obtained where efficient spraying was carried out, with the result that very little loss of fruit ultimately occurred.

The dry weather during the summer was favourable to insect pests, but these were kept under control where it was possible to maintain the full spraying programme.

Brown-rot of Stone-fruits.—The position with regard to this disease showed an improvement on last year. In Otago the disease was much in evidence at blossoming-time, but the fruit at harvesting-time was relatively free of infection. The necessary precautions were taken, with satisfactory results.

Citrus Brown-rot.—In the Auckland Province this disease caused some loss during the winter, especially where preventive measures fell short of official recommendations.

Fireblight.—Except for the Nelson district, where fireblight was a little more widespread, especially in quinces, in spite of all care being taken, fruit-trees were not severely affected. Some varieties of Cotoneasters appear to be highly susceptible to this disease.

Ripe-rot on Apples.—Spraying with Bordeaux mixture for this disease is now the general practice. This spray has reduced the infection to a point where it may now be regarded as of relatively little commercial significance.

Silver-leaf.—In the Poverty Bay, Hawke's Bay, and Manawatu districts, silver-leaf caused severe losses of stone-fruit trees.

Verticillium Wilt.—This disease was recorded in the Alexandra district on young apricot-trees which had been planted on land where tomatoes and potatoes had been grown previously.

Crown Gall.—Chinese-gooseberry plants were found to be affected with this bacterial disease. A survey is being made to determine how widespread the disease has become. The possibility of this disease becoming of economic significance in the future is being considered.

Codling-moth.—The dry, warm weather being favourable to its increase, codling-moth was again troublesome. Generally, good control was secured when the full lead-arsenate spraying programme was carried out. In the Moutere Hills district of the Nelson Province growers were unable to spray their trees on account of water shortage, and suffered accordingly. In Auckland and Otago an increase in the number of codling-moth stings on the fruit was recorded.

White Butterfly and Diamond-backed Moth.—These pests were not very troublesome during the year.

Citrus Canker.—Small outbreaks of this disease have occurred during the year in the Gate Pa area at Tauranga, on one tree at Opotiki, and among a few citronelle-trees growing wild along the Kerikeri Inlet about two miles from the citrus-growing area. Precautionary measures have been taken to localize the infections.

Small Fruits

As a result of the demand and consequent high prices received, increased interest is being taken in the growing of small fruits, but the supply of these fruits is still not equal to the demand. While the production of strawberries, raspberries, loganberries, currants, and gooseberries is being maintained, there is room for expansion of this section of the fruit industry. Chinese gooseberries and feijoas are now being planted in greater quantities.

The commercial areas under this class of fruit are distributed as under:—

	Area (in Acres).					
	Straw-berries.	Rasp-berries.	Logan-berries.	Goose-berries.	Currants.	Other Berries.
Auckland	148	..	8	37	..	..
Poverty Bay	..	..	1	..	..	..
Hawke's Bay	7	4	4	3	6	..
Wairarapa	3	45	3	28	36	1
Manawatu	2	18	2	1	2	3
Nelson	5	290	2	8	15	55
Canterbury	35	186	3	26	65	..
Otago	20	32	..	7	5	..
Otago Central	10	25	2	..	1	1
Totals	230	600	25	110	130	60
Estimated production (tons)	250	750	40	150	150	120

Viticulture

Weather conditions were not favourable for the growing of outdoor table grapes, with the result that the crop was of only medium quality and quantity compared with the previous year. No obvious extension in the area of outdoor table grapes has occurred during the year. Some plantings of Albany Surprise, however, have taken place, mainly on account of the high price being paid for grapes over the last year or two by the winemakers. These grapes will in all probability be used for market purposes when the wine-grape market becomes stabilized.

Indoor Grapes.—In all districts an excellent crop was harvested. Growers with heated houses again marketed late crops at good prices. The shortage of labour experienced in previous years was not nearly so noticeable, and in most cases the vineries were maintained in better condition.

There is not a great extension taking place in the planting of vines for market purposes. There was only one inquiry during the year for plans of a glasshouse for the growing of grapes under glass. This is mainly due to the shortage of suitable glass, the high cost of building, and the shortage of man-power.

Wine Grapes.—The crop of wine grapes in the Waikato and Henderson areas was far below that of the previous year. The adverse weather seriously affected production in these areas, and considerable losses, amounting in some vineyards to 50 per cent., were experienced.

In the Hawke's Bay area the crops were good and ripened well, being, in general, considerably better than last year. Slight frost damage occurred in the Hawke's Bay and the Gisborne districts in the early part of the season.

Wineries and Vineyards

Large extensions were made to wineries in the Henderson and Hawke's Bay areas. These were mainly the erection of storage tanks and the installation of concrete fermenting-vats. A number of additional distillation units were also erected during the year.

Diseases.—Under Glass: Very little trouble was experienced from fungous disease. Mealy bug, however, continues to do considerable damage, but the improved fumigation methods introduced by the Department of Agriculture in co-operation with the Plant Diseases Division of the Department of Scientific and Industrial Research have proved effective.

The Plant Diseases Division is still conducting fumigation experiments in the experimental glasshouse at Mount Albert to ascertain the correct dosage for the fumigation of vineries during the winter season.

Outdoor: Where effective spray schedules were maintained, downy mildew, powdery mildew, and black-spot caused no trouble. There was little loss, except in the Henderson and Waikato areas. It appears inadvisable on the part of the wine-grape growers in the Auckland and Waikato areas to plant varieties of grapes which are susceptible to these diseases. The Franco-American hybrids, which are more resistant to disease, are far better suited to the damp, humid conditions experienced in these areas.

Insect Pests.—Less damage occurred this year than formerly. Brown beetle, which caused considerable damage in 1944 in the Havelock North vineyards, did not make its appearance this season.

Wine-production.—The approximate area under outdoor grapes grown for wine-making is 700 acres, 200 acres of which have not yet come into production.

The production of the 170 winemakers licensed was approximately 357,000 gallons of wine, mostly of the sweet red and sweet white type.

The approximate total quantity of wine produced and consumed in New Zealand since 1940 is as follows:—

	Gallons.
1940	185,000
1941	186,000
1942	207,000
1943	309,000
1944	348,000
1945	357,000

During the year instruction was given to grape-growers on all phases of viticulture. Winemakers were given technical advice in connection with winemaking and also in respect to improvements of plant and buildings.

Cider-making

Throughout the Dominion 32 cider-makers were recorded, the production of cider being 87,000 gallons.

Royal Commission on Licensing

Early in the year under review evidence was given before the Royal Commission on Licensing on every phase of viticulture and winemaking in New Zealand, and the prospects of further development of the industry.

From the economic aspect it should be noted that the wine industry directly and indirectly provides employment for a large volume of labour in the vineyards and wineries, and also in the bottle-manufacturing industry, case-making, coopering, printing, and other trades.

Owing to the control of wine importations, there has been an increased demand for New Zealand wines in recent years. To meet this demand some wines of inferior quality were marketed, but with conditions now returning to normal it may be expected that only wines of good quality will be readily saleable.

Te Kauwhata Horticultural Station

The grape crop at Te Kauwhata during the year 1945–46 was light, due to adverse climatic conditions. The spring was colder than usual, and although rain fell on a large number of days, the actual rainfall was not unusually high. A number of frosts were experienced, the last one being on 9th December.

There was almost complete absence of fungous diseases in the vineyards this year, due to the summer weather conditions and to the spray programme carried out.

In the sales of wine another successful year was again experienced. A supply of apple wine made some six years ago for experimental purposes was released for sale and proved most popular. In view of this, further quantities were again made this year.

A small area of the land previously used for grazing of sheep has been prepared for planting out in vines.

Vegetable-production

Vegetables have been produced on a substantially increased acreage, and commercial vegetable-production is gradually being adjusted to normal peacetime requirements. Regular, periodic inspections of vegetable-producing areas have been carried out.

Registrations

In accordance with the provisions of the Commercial Gardens Registration Act, 1943, registration of commercial vegetable-producing areas during 1945–46 were 2,482, involving 17,600 acres, 600 acres of which were devoted to the production of glasshouse crops.

Standard Grades

In co-operation with the Standards Institute and representatives of the Dominion Council of Commercial Gardeners, a satisfactory basis of standards for certain specified vegetables has been agreed upon.

Tobacco Industry

The production of tobacco, which is confined to the Nelson Province, shows an increase this year. The comparative figures for the 1944 and 1945 harvesting years are :—

	1944.	1945.
Acreage cropped	3,093	3,383
Poundage sold	3,100,000	3,288,968
Number of licensed tobacco-growers ..	414	487

The industry is now soundly established, and further increase in production is largely dependent on availability of suitable land and of seasonal labour, especially female labour. During the year 68 male and 236 female seasonal employees for harvesting the leaf were secured through the National Service Department.

Growers are required to obtain from the Tobacco Board a license to grow tobacco which is produced under contract to one of the several tobacco-manufacturing companies.

Hop Industry

Over a period of many years the hop-growing industry, which is located in the Nelson Province, has changed very little. The area under hop-production in 1945 was 621 acres. Unfortunately, the poor growing season has resulted in a low yield, the estimated production being 1,750 bales, compared with 3,203 bales for the 1945 season.

Beekeeping

Commercial beekeeping in New Zealand made excellent progress until war conditions created difficulties in transport and a general shortage of labour and essential apiary equipment. To meet this situation many beekeepers were compelled to reduce the number of hives kept. On the other hand, there has been a sharp increase in the number of domestic beekeepers who have established a few hives in an endeavour to offset the shortage of sugar-supplies and to provide sufficient honey for their own table use.

There are at present 6,507 beekeepers in New Zealand, who own 9,445 apiaries containing 129,576 colonies, the distribution in the various apiary districts throughout the Dominion being as follows :—

Apiary Inspection District.	Number of Beekeepers.	Number of Apiaries.	Number of Colonies.
Auckland	1,462	1,598	16,020
Hamilton	848	1,456	32,865
Hastings	859	1,245	13,331
Palmerston North	1,258	1,909	21,394
Nelson	447	547	6,379
Christchurch	729	1,362	20,714
Dunedin	904	1,328	18,873
Dominion totals	6,507	9,445	129,576

Climatic Conditions and Production.—Climatic conditions throughout New Zealand varied to a considerable degree during the 1945–46 honey season, which was three to four weeks later than usual in most districts. Conditions generally improved from December onward in both North and South Islands, with the exception of Hawke's Bay, Wairarapa, North Canterbury, and parts of Southland, where honey-production was down from half a normal crop to a complete crop failure in some localities. In the remaining districts average to excellent crops of good-quality honey were secured.

The estimated normal production of honey harvested in New Zealand at present (based on the number of hives registered at June, 1945) from commercial and domestic apiaries is 3,259 tons, while production from all sources for the year ended 31st March, 1946, was estimated to be not less than 3,116 tons of honey and 89,925 lb. of commercial beeswax.

Marketing.—During the war beekeepers were required (under the Honey Emergency Regulations) to supply a certain percentage of their crops each year to a central depot, essentially for the supply of wartime priorities. The regulations have now been revoked.

All sales of honey made in New Zealand by beekeepers outside of the central organization, which is again operating on a voluntary basis, are of a private nature. This year no difficulty is experienced in disposing of all surplus honey at the ceiling prices allowed under existing Price Orders.

Instruction.—There has been an increasing demand for information and advice on all phases of apiculture. These requests have been met by correspondence and visits to the apiarists, also by lectures and demonstrations at organized meetings of beekeepers, as well as by publication of special articles in the *Journal of Agriculture*.

With a view to improving beekeeping standards in New Zealand, two illustrated bulletins were issued dealing with "Bee Diseases" and "The Establishment of a Domestic Apiary." A third bulletin, "Practical Beekeeping in New Zealand," has also been prepared and is now being printed.

Research Work.—A great deal of research work on beekeeping problems has been carried out in conjunction with the Plant Diseases Division, Auckland, and at the Animal Research Station at Wallaceville. This work included the use of pollen substitutes, humidity in relation to low specific gravity and fermentation of honey, and the effect on hive bees of D.D.T. when used extensively for the control of orchard pests. Other experimental work commenced during the year is being continued.

Employment of Beekeepers.—To maintain the production of honey and commercial beeswax at as high a level as possible, a number of competent beekeepers were employed in the various apiary inspection districts to assist the Department's permanent officers in the detection and control of bee diseases. Working under this seasonal arrangement, 18,563 hives were inspected, and reports indicate that the disease situation generally in the areas inspected is well in hand.

Expansion of Beekeeping in New Zealand.—A survey by counties was completed during the year to ascertain the scope for additional apiaries in the Dominion. This shows that the overall spread of commercial apiaries in partly stocked and understocked districts suitable for the production of good-quality marketable honey could be increased at present by at least 20,000 hives. Expansion beyond these limits will be possible as new country is cultivated and sown in permanent pastures.

While present apiary inspection districts are very large and the calls for extended services in various directions tend to increase, the beekeeping industry as a whole was serviced very effectively by departmental officers during the year.

Experimental Work

Hazel Nuts.—Experiments in hazel-nut culture were continued in Tauranga and Gisborne districts. The trees are growing well, and this year a few nuts were gathered. New varieties have now been planted alongside the older trees for pollination purposes, and future results are awaited with interest.

Sunflowers.—Trials are being conducted with three new imported varieties of sunflowers. They were grown in Tauranga, Blenheim, and Motueka districts. The seed has been harvested and appears to be of good quality. Samples are being submitted to the Dominion Analyst for analysis of oil content, while specially selected seed has been saved for future sowing as required.

There is no doubt that this crop can be grown successfully in the Dominion and that these new varieties are more satisfactory than those previously grown here. It is, however, too early to say whether or not the crop will prove to be a commercial proposition, due to labour costs in harvesting and separating the seed from the heads.

Raspberries.—A study of the physiological trouble in raspberries is being made in the Tadmor district, Nelson, where cultural and spraying trials are being carried out in conjunction with the Plant Diseases Division.

It is also proposed to institute co-operative trials in the Wairarapa district at Greytown for the purpose of investigating the causes of the recent decline in the vigour and cropping capacity of certain raspberry plantations.

RURAL DEVELOPMENT DIVISION

REPORT OF P. W. SMALLFIELD, DIRECTOR

The Division was formed on 1st December, 1944, and the past year has been occupied with the organization and training of staff, the collection and tabulation of basic information required for cost-of-production studies, and the preparation of reports on the Dominion's primary industries. Field work has been restricted to the Auckland and Canterbury districts, but will be extended to the Wellington, Otago, and Southland districts during the coming year if the necessary staff can be secured.

Food and Agriculture Organization

The Division has been assigned the duty of compiling the information required by the United Nations Food and Agriculture Organization on the Dominion's primary industries, of distributing the Organization's literature, and of publicizing its work to improve world food-production and nutrition. The organization may well provide the means for the rational planning of world food-production and thus confer benefit on both food exporting and importing countries, for the aims of FAO are " . . . raising levels of nutrition and standards of living of the peoples . . . , securing improvements in the efficiency of production and distribution of all food and agricultural products, bettering the conditions of rural populations, and thus contributing to an expanding world economy . . . "

It is expected that the work connected with the Food and Agriculture Organization will become a very important section of the Division's activities.

Agricultural Development Committee

This Committee was originally constituted as one of the main planning Committees of the Organization for National Development, with the Division supplying the Secretariat. Since the decision to dissolve that Organization, the Committee has continued with its work under the jurisdiction of the Minister of Agriculture.

During the year the Committee concentrated mainly on investigating the possible development of the various branches of specialized intensive farming, with particular reference to the scope for settlement of ex-servicemen for the guidance of the Rehabilitation Department. Reports on the citrus-fruit and beekeeping industries were completed by sub-committees which included representation of the respective producers' organizations. Sub-committees on the pip- and stone-fruit and poultry industries have also met and their reports are nearing completion. A survey of commercial vegetable-production is being conducted through the field officers of the Horticulture Division to provide the necessary basic data for a similar report on the vegetable industry.

Special attention has been given by the Committee to the possibilities of co-operative farm machinery and labour pools in meeting the farmers' seasonal requirements. A close study is being made of the co-operative machinery scheme initiated by the Kaikohe Co-operative Dairy Co., Ltd., so that the experience gained may be used in the organization of similar schemes in other districts.

The major problem of lime-distribution has been considered and some progress made in co-operation with the Railways Department and cartage contractors to test the effectiveness of storage silos at strategic distribution points as a means of relieving the congestion that occurs during the period of peak demand for lime.

Other surveys carried out for the Committee were—

Import requirements of farming.

Co-ordination of the seasonal labour requirements of forestry and farming.

Need for renewal of pastures in the main dairying districts.

Wintering of dairy herds on swamp-land dairy farms.

Farm Management and Economics

During the year the Farm Management and Economics Section has prepared a number of departmental reports on the Dominion's primary industries. Field surveys have been carried out on the effect of place in rotation on wheat yields, winter beef-production, development of pumice land in the Rotorua-Taupo area, and the production of dairy heifers on fat-lamb farms.

The following articles in the "Farming in New Zealand" series were published in the Department's *Journal of Agriculture*: "Land Development"; "Store and Breeding Stock"; "Land Legislation"; "The Farm Home"; "Imports"; and "Wartime Farming."

Farm Engineering

Shortage of trained staff has retarded the development of the Farm Engineering Section. Data have been collected on tractor usage in the Dominion, and surveys are being undertaken on the implements and machinery commonly used on farms and working-costs for each item of equipment.

Statistical Section

The volume of work handled by the Statistical Section has increased greatly during the year. In addition to the routine work of compiling statistics and tabulating data collected by the field staff, the Section has furnished information covering a wide range of subjects in response to requests from other Divisions of the Department, other Government Departments, and the general public.

The routine statistics compiled by the Statistical Section consist of monthly butter and cheese production and butterfat supply to dairy factories, live-stock slaughterings, wool pull and sales of pelts, fertilizer-manufacture (until December, 1945, when the work was taken over by the Fields Division), and the quarterly statistical statement. This quarterly statement was originally prepared to provide information on wartime food-production and is being continued as a basis for information required by the Food and Agriculture Organization.

Rural Sociology

The work in rural sociology has covered the preparation of articles on home management and economics for the Department's *Journal of Agriculture* and surveys on farm housing and rural population patterns. The farm housing survey is being conducted in co-operation with the Women's Institute and the Women's Division of the Farmers' Union. A survey of small country towns and villages of the South Island has been partially completed, and work will be commenced in the North Island during the coming year.

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