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NEW ZEALAND.

DEPARTMENT OF SCIENCE AND INDUSTRIAL RESEARCH

(REPORT OF).

STATEMENT BY THE MINISTER IN CHARGE (RIGHT HON. J. G. COATES).

Laid on the Table by Leave of the House.

INDUSTRIAL AND RESEARCH ACTIVITIES.

DURING the past decade three main considerations have resulted in a general feeling that New Zealand must be in the forefront in the application of science to its industries—firstly, the prominent examples of the proven advantages of scientific research to newer industries; secondly, the enormous post-war developments in almost all countries in organized research on national lines; and, thirdly, the potentialities of considerable improvements in the more old-established industries through fuller utilization of scientific practices.

In particular, it was recognized that science, through research, had opened up many new opportunities to agriculture. Two of the main industries of the Dominion—meat and dairy—provided singular examples which made this recognition inevitable. It was felt and realized that while science had proved its value in the field of production generally, yet at the same time this value had not been fully exploited. Consequently, the need for the expansion of research activity was felt in order that our primary industries might be provided with constantly improving and thoroughly sound bases upon which to build their future economic security.

Moreover, because of the unavoidable hazards involved in the farming business, and the vital relationship of agriculture to the whole business of the Dominion, the public interest justified special Governmental effort in this direction. Since the farming industry is comprised of small productive units, and the same being true of the manufacturing industries of the Dominion also, it is well-nigh impossible for individual farmers or manufacturers to keep abreast of the scientific methods adopted by overseas organizations. In such circumstances the need for the Government giving a lead and fostering co-operative scientific effort was but a natural far-sighted endeavour in the national interest.

Again, it is of fundamental importance in considering legislation connected with agriculture or industry that it should not be enacted as emergencies arise or have arisen, but should be adopted in advance of such, with a view to removing causes and enabling them to be met as they occur.

Consequently, two years ago, the Council of Scientific and Industrial Research was constituted, and an executive Department established by legislation for the purpose of co-ordinating research work in the Dominion and promoting research and investigation in all industries, both primary and secondary.

The method of administration and operation of the Department aimed at being as simple as possible, free from political bias and political pressure, while the policy I laid down as Minister was to take the public and industries fully into our confidence and carry out work in co-operation with them. It was realized that, as results in research depend largely on sustained effort, full benefit from this policy of national research could be expected only after a few years of operation, and for a sustained effort in the right direction industry must take a responsible part.

The attention of the Research Council was first directed to arranging practical co-operation and effort through all possible existing institutions capable of conducting research. The results have been decidedly promising, institutions and workers, which hitherto had preserved a certain degree of isolation and aloofness, having come together in an earnest spirit of co-operation.

During the two years now almost elapsed since the passing of legislation, definite arrangements have been made for the conduct of some dozen major projects of research connected with Dominion industries, while the organization of others, particularly those relating to the secondary industries,

was held over pending a thorough investigation of similar efforts in Canada, United States, and Great Britain.

The following indicates, in summary form, what has been accomplished for the promotion of the various researches :—

DAIRY RESEARCH.

A Dairy Research Institute has been established, financed by contributions from the Dairy Control Board, with Government subsidy. The Institute has been located alongside Massey College, and linked up with the researches of the field laboratories at Hamilton and Hawera, to which laboratories grants have been made from the research funds for specific research work more suitably decentralized.

The Institute is provided with well-equipped chemical and bacteriological laboratories, and an experimental factory, capable of both butter and cheese manufacture, has been made available to maintain the contact of the laboratories with actual factory problems.

The Institute is managed by a representative committee, which has appointed an expert staff capable of dealing with the most difficult problems that may arise. Although, owing to the necessity of training the staff overseas, the laboratory has been in operation only a few months, its influence already is being felt in lifting up the standard of technical discussions in connection with dairy manufacture in the Dominion, while several problems already have been dealt with.

NOXIOUS WEEDS RESEARCH.

At Cawthron Institute, Nelson, an up-to-date Biological Laboratory and insectaries have been constructed and fully equipped, providing such facilities for this work as are not excelled in the Southern Hemisphere. Investigations are being concentrated upon ragwort, gorse, pipiriri, blackberry, and bracken-fern, and, in the case of the first-named, an insect parasite has been thoroughly tested, which, when liberated, will bid fair to control effectively the spread of ragwort. Its liberation is anticipated to take place during the present summer.

Promising results also are being secured in the case of gorse-controlling insects, but in the cases of insects attacking other weeds much yet remains to be done in order to secure species which do not extend their range of attack beyond the particular plants with which they are intended to deal. The public may rest assured, however, that the experiments are under the best possible guidance, and liberations will be made only after the satisfactory completion of exceedingly rigorous tests and where the economic advantages are definitely proved.

The Empire Marketing Board has interested itself in this research, and is contributing to its cost at the rate of £2,000 annually. In addition, the Board provided a grant of some £1,300 for capital expenses towards the £2,000 required.

FOREST ENTOMOLOGY.

The increasing risk of insect infestation of our indigenous timbers, and the dangers to which the large areas of young exotic plantings are exposed, have led the Forestry Department and Research Council to realize that a minimum measure of protection against insect pests is absolutely necessary. A scheme of co-operative endeavour with sawmilling and afforestation interests has been evolved, and arrangements are fairly well forward. It is suggested that the work be directed from a Forest Entomological Research Station at the Cawthron Institute, since at this Institute there already has been developed considerable entomological investigation in other directions.

WHEAT RESEARCH.

Wheat-growers, flour-millers, and bakers have co-operated to provide funds for the pursuit of investigations into problems affecting wheat, flour, and bread. In consequence, a Wheat Research Institute has been established and a laboratory provided in association with Canterbury College, Christchurch. Here, chemical and biological tests will be made, the results of which will be used for guidance in the growing of wheat, the manufacture of flour, and in the baking of bread. The object in view is to provide the consumers with a first-class highly-nutritive bread from wheat grown and milled locally, and to make the Dominion self-sufficing so far as its wheat supplies are concerned.

Wheat breeding and selection, manurial and variety trials, experimental milling and baking tests, will all form part of the activities of the Institute, with which Canterbury Agricultural College and the Department of Agriculture are actively co-operating. The methods and results of similar work by the British Flour-millers' Research Association at St. Albans have, by arrangement, been made available to the Institute.

Up to the present, all the preliminary work has been carried out, and, now that the staff and equipment are to hand, the work of the Institute should be in full operation in all its phases early in 1929.

The most pleasing feature of the work has been the whole-hearted co-operation of millers, bakers, growers, and agricultural officers, and, as with other researches, the work and discussions raise the whole standard of accuracy of thought in connection with wheat matters, enabling issues to be fairly faced and frankly discussed on a basis of facts.

MINERAL CONTENT OF PASTURES.

The great reliance of the Dominion upon its pastures, and the future prospects of considerable results to be achieved from careful attention to them, has warranted the closest investigation of those factors which endow pastures with their nutritive and stock-raising capacity. The presence of areas supporting luxuriant pastures of obvious low nutritive value, where stock actually become emaciated

and die in the midst of abundant feed, has brought prominently to notice the importance of attention to the mineral content of grasses and clovers. Bush sickness, caused by iron deficiency, and King-country diseases, caused by calcium and phosphate deficiencies, by their very acuteness have drawn attention to the need for research into the nutritive content of all pastures, for there are many where the deficiency, though present, does not reach the acute stage.

With the aid of an annual grant of £2,000 from the Empire Marketing Board, work has been in progress for some time on the deficiency areas of the Rotorua, Waikato, and King-country districts, where the investigations are being conducted by officers of the Department of Agriculture. In the Nelson Province, similar work is being undertaken by the Cawthron Institute. Soils and pastures are being analysed, feeding trials are being conducted with stock, and specially prepared mineral licks and medicines are being administered in order to ascertain, firstly, the cause of stock unthriftiness, and, secondly, means of curing this trouble. The solution of these problems will bring into more effective use thousands of acres of land which at present are incapable of maintaining stock in a healthy condition, and possibly provide a check to such diseases as sterility, abortion, &c., which annually cause large stock losses throughout the Dominion.

The future prosperity of the Dominion lies largely in the increase of its stock population, and these investigations are aimed at (1) bringing into use additional areas; (2) increasing the carrying-capacity of areas at present in use; (3) checking losses incurred through diseases and loss of constitution.

The first two quarterly reports to hand indicate definitely that the results of these researches will be of considerable economic value to the Dominion, and have justified the Empire Marketing Board in offering to continue their subscription for the full period of five years considered necessary to reap the full benefit of the work.

SEED AND PLANT RESEARCH STATION.

At Palmerston North, adjacent to the Massey College property, there has been established a Plant Research Station, where the co-ordinated efforts of the staffs of the Department of Agriculture and the Department of Scientific and Industrial Research will engage in investigations concerned with the control of plant-diseases, the certification and standardization of seeds, pasture establishment, management, and control.

The investigations embrace both laboratory and field work, and are designed to save some of the annual loss of £2,000,000–£3,000,000 which is attributed to plant-diseases, to increase the quality and standard of our main lines of grass and clover seeds, and to enhance the quality of our pastures by attention to grass development, fertilization, and management.

Work at this station is now in full progress, and a large number of investigations are proceeding, many of which are being co-ordinated with those conducted elsewhere in research stations abroad. The Empire Marketing Board has interested itself in the projects, and is contributing £2,500 towards capital costs and £2,500 annually in promotion of the activities of the station. The work of this Research Institute is regarded as one of the most promising major activities of the Department.

PHORMIUM FLAX RESEARCH.

A Co-operative Research Association of flax-millers and flax-growers has been established, and the Massey College has undertaken to work with this committee on the breeding of strains of flax possessing desirable qualities of yield, fibre-strength, and disease immunity.

Investigations also have been carried out as to methods of chemically treating fibre so as to secure better colour without loss of strength, while the committee also has arranged for tests and investigation of the use of fibre for fine high-grade papers.

Methods of testing for strength of fibre have been evolved; but a survey of the whole situation has shown that certain methods of stripping so seriously impair this strength as to limit the usefulness of flax for cordage. The work on both breeding of flax and its subsequent treatment mechanically or chemically is, therefore, important, so that the fibre of the future may be standardized and of the highest quality.

The flax industry is in a somewhat difficult position, and some additional major use for flax will be necessary in view of the large areas at present being planted. Considering the funds at the disposal of the committee, very satisfactory progress has been made.

LEATHER RESEARCH.

A Leather Research Association has been formed, and funds for research subscribed by tanners throughout the Dominion. Up to the present friction tests have been carried out with New Zealand-made leathers in order that comparisons might be made with imported material and that possible defects in the methods of manufacture might be traced. This is necessary in order that a larger proportion of the leather requirements of the Dominion may be provided locally.

The tanning materials and water-supplies available to manufacturers have been analysed, while a certain amount has been done by way of scientific control of various processes. The great possibilities of such action have led to the appointment of a research chemist with overseas experience in both manufacturing and laboratory work. This officer is working for the Tanners' Research Association, and the whole arrangement promises well.

FISH RESEARCH.

The problem of the fish-food content of the coastal waters of New Zealand has been under investigation in conjunction with the Marine Department. The nature of the food consumed by our main

varieties of edible fish, the extent to which it occurs in coastal waters, and variations in its composition, have important bearings on the whole future of the fishing industry.

Other investigations are in progress upon the food, habits, age, propagation, and diseases of both native and introduced species, special attention (in co-operation with the Marine Department) being devoted to salmon and trout.

COLD STORAGE.

The development of a successful market for New Zealand fruit in the United Kingdom is dependent upon the devising of suitable means of transport by way of cold storage. Fruit, being a living entity, presents problems very different from those appearing in the case of such materials as meat, butter, and cheese. As yet, knowledge of fruit transportation under cold-storage conditions is too imperfect to give full assurance that cargoes can be landed in London, the world's best market, in sound condition with no predisposition to rapid wastage.

Acting in co-operation with the Low-temperature Research Station at Cambridge, and with the shipping companies, arrangements for the most complete investigations into the behaviour of fruit under cold-storage transportation conditions were made, through the co-operation of the Agricultural Department and the Fruit Control Board. The vessels under examination carried special recording-instruments; cases of fruit of known origin and quality were packed in New Zealand, accompanied by a complete life-history, and were despatched under ordinary cargo conditions. These were subject to examination by skilled officers of the Low Temperature Research Station at Cambridge, England, and the results have been compiled. While it is not anticipated that the results of one year's work will give conclusive information on all the phases of this very difficult problem, yet results of definite value have emerged.

Work also is under way on conditions which may cause loss of bloom of meat under cold storage and transportation.

A local problem of considerable interest to onion-growers has also been attacked. The difficulty of keeping onions in sound condition for sale in the spring and summer months has not yet been successfully overcome. As a result the Dominion is obliged to import its requirements, and, in consequence, onion-growing locally is restricted by the capacity of the market to absorb its produce during a limited portion of the year.

Tests are being conducted in Christchurch at the present time to record the behaviour of onions under cold storage, and, if possible, to devise methods of maintaining their condition sound and marketable under this treatment. These tests, carried out in co-operation with the Department of Agriculture and the growers, if successful, should help to encourage onion-growing until the Dominion is self-supporting in respect of this commodity.

PAKIHI LANDS.

The desirability of bringing into utilization the waste lands of the Dominion has led to experiments being planned to deal with the pakihi lands of Nelson and Westland. These cover an area of some 180,000 to 200,000 acres, the present total production from which is negligible in amount. Small-scale experiments which already have been in progress for a short period show some promise, and it is hoped ultimately to indicate possible economic methods by which the lands may be brought into utilization. The experiments now in progress are being conducted by the Cawthron Institute with funds supplied by the Westport Borough Council, the Buller County Council, and the Department of Scientific and Industrial Research. The Department of Agriculture also is collaborating with Cawthron Institute with regard to the method of attack.

WOOL.

A prolonged survey has been made of the difficult question of what researches are most worth while in connection with improvement in quality of wool. In connection with this survey, tests of wool-fibres have been carried out, and considerable information collected from research organizations overseas. It is important that any marked trends in the quality of our wool should be discerned, contributory factors such as breed, management, or nutrition isolated, and guidance indicated as to remedial measures.

The Romney Association have pioneered this work by a grant. A strong advisory committee composed of wool-growing interests, Agricultural Colleges, with officers of the Departments of Agriculture and Scientific and Industrial Research, has the question in hand, and has put forward suggestions for definite investigational work.

MEAT INDUSTRY RESEARCH.

Negotiations are still proceeding with representatives of the meat-freezing companies with the object of the formation of a Meat Products Research Association, in the management of which the industry representatives will predominate. Meantime, investigations have been made into most phases of the industry, and two processes—viz., dry-rendering and nitrite pickling—have been specially investigated.

Dry-rendering produces a large yield of highly nutritious meat-meal, which will prove of great value in connection with pig and calf feeding. The use of sodium-nitrite pickle enables the production

of a standardized canned meat of excellent quality, shortens the process of manufacture, and leaves the meat-juices (which hitherto had to be discarded on account of their high saline content) available for meat-extract.

In addition, considerable information has been gathered and conveyed to the industry regarding the treatment of pelts, in the anticipation of better prices being obtained for these.

The prices received for stock by the farmer depend in no small measure on the efficiency and utilization of by-products in the frozen-meat industry.

FOOD-VALUES.

Realizing the need for providing exact information to workers concerned with feeding experiments connected with the utilization of such materials as meat-meals, whey-paste, fish and fruit by-products, fundamental nutrition investigations have been conducted, under the direction of Professor Malcolm, at the Otago Medical School. These experiments are carried out by the use of the latest methods of nutritional technique, and involve elaborate analyses and small-scale feeding trials. The information so secured should simplify the experiments conducted with animals in the field by investigators working along more general and extended lines.

In conjunction with the Lister Institute, co-ordinated researches are also in progress on the vitamin content of New Zealand butter throughout the various months of the butter season.

The question of the vitamin content is one of increasing moment, and there would appear to be no reason to doubt that New Zealand's beneficial climatic conditions will be reflected in large vitamin content of butter produced at all times of the year.

PIG INDUSTRY.

The possibility of building up an important export trade in bacon and pork from the Dominion, which is so favoured in respect to supplies of animal feeds as by-products of the dairy and meat industries, has led to researches being commenced upon the response of pigs to various systems of breeding, feeding, and management.

The work is being directed from three centres—Lincoln College, Massey College, and Hamilton. Regular records of feeding, weight-increase, and systems of management are being made in these districts during the present season. The results will be carefully compiled and examined by a special committee, and it is hoped that the information so secured will prove of great value in guiding the industry along right lines at the inception of the export trade. If pork export is to be built up on present prices, the most economical use of available foodstuffs will be necessary and best management practices adopted.

PORK AND BACON RESEARCH.

In view of the specially difficult transport conditions in New Zealand, manufacturers of bacon and pork have experienced much difficulty locally in the production of hams and bacon of good keeping-quality.

An association of bacon-manufacturers has financed investigations into curing methods, the work to be carried out by one of the Department's officers. Numbers of analyses of ham and bacon have been made locally to ascertain such information as depth of salt-penetration, effect of smoking, drying, and wrapping, and the influence of these upon both eating and keeping quality.

It is hoped that when all the investigations at present in progress have been finalized there will be available to the industry such definite information regarding such matters and processes as will enable the production of the very highest quality ham and bacon.

FUEL RESEARCH.

The unfortunate condition of the coal industry in Britain and elsewhere, the world-wide developments taking place in utilization of fuels, and the desirability of New Zealand being self-supporting in regard to fuel, all pointed to the necessity for fuel research so that knowledge might be gained of the suitability of our coals for various purposes and for extended uses. Consequently, in accordance with the Department's general policy—viz., that of co-operating with industry—a Fuel Research Association was formed. The coal-mine owners of the Dominion have agreed to bear one-half the cost of experiments designed to ascertain new uses for New Zealand coal and its extracted products. Two qualified scientists have been appointed, apparatus assembled, and a laboratory set up, which is now in full working-order. The various coals are under analysis and treatment in a model retort. In addition, four valuable bulletins summarizing existing knowledge have been compiled and published, and the demand for these has been exceptional, showing the general keen interest in the subject.

BUREAU OF STANDARDS AND TECHNOLOGICAL LIBRARY.

During the past year proposals have been under consideration by the Council of Scientific and Industrial Research for the establishment of a Bureau of Standards and Technological Library, the object being to afford service to primary and secondary industries generally by making arrangements for fundamental work of Dominion importance, the maintenance of standardizing and testing facilities, and for an improved information service.

BUREAU OF INFORMATION.

The Department throughout has acted as a clearing-house and bureau of information for numerous inquiries on all phases of application of science to industry, a service which has been increasingly appreciated.

GENERAL.

In addition to fostering industrial research, the Department has consolidated many of the Governmental scientific services, such as Dominion Laboratory, Geological Survey, Road Materials Testing Laboratory, Meteorological Office, Observatories, &c., with a view to more co-ordinated effort.

When the cost of these services is taken into consideration it is found that, for the proposed financial year, the cost to the Government of all the research activities enumerated in the foregoing, together with a special grant of £3,700 to Lincoln College, is £20,000, an amount insignificant in proportion to the national benefits likely to accrue.

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