OPENING ADDRESS

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THE STORY of the expansion of farming in New Zealand is one of overcoming the factors limiting production. In the North Island, development since the 1890s may be conveniently divided into four periods. The first period, extending from 1890 to approximately 1920, was remarkable for the destruction of some ten million acres of native vegetation which enabled our cattle population to increase by about two million and sheep by about five million.

The second phase, extending from 1920 to approximately 1950, was concerned mainly with land improvement, mostly in the physical sense — timber clearing, fencing, and improving pastures with fertilizers, better grasses and clovers — and resulted in cattle numbers increasing from three to five million, dairy cattle from one to two million and sheep from 23 to 35 million.

These were impressive gains, but the third period, extending from 1950 to 1965, was no less so; in this period, as a result of applied technology in various forms — aerial farming by topdressing, oversowing and pest destruction, continued improvements in plant and animal breeding and animal health, to mention the most obvious — cattle numbers increased from five to seven million, sheep from 35 to 57 million, while dairy cattle numbers remained at the two million mark.

The current period could well be regarded as starting from the Agricultural Development Conference in 1964 at which were set targets for farming well beyond the visions of the most enthusiastic pioneers. These fresh targets will be achieved, however, only if our farmers have a broad appreciation of a wide span of scientific principles that affect the efficient production of crops, pastures and livestock, and in sorting out the limiting factors likely to apply in the current phase of development it is clear that one of the most important, if not the most important, factor restricting grassland production in New Zealand, will be in the field of pest control and its associated field of weed control. The production of trained specialists to tackle the problems already being met in this area means ever-increasing demands on the educational services, particularly those at university level.

There are a number of ways in which these demands can be met by the universities. One way is for the universities to produce specialists at the first degree level, tailor-made for specialized jobs. However, when one considers the diversity of jobs for which holders of first degrees are required, it soon becomes clear that postgraduate training at a university or in-service training after graduation provided by industry itself provide many more training opportunities. Despite these, your industry's needs for adequately trained personnel are not being met, and in view of the recent statements and reports attributed to Cabinet Ministers suggesting there should be a re-assessment of the role of New Zealand universities in training scientists to carry out research and provide scientific services for the country, I wonder if now is not the appropriate time for universities which can to embark on Conversion courses — courses which enable people who have specialized in one field to become interested or even specialize in a different field.

An interim report to the National Research Advisory Council, "Some Aspects of Technical Manpower in New Zealand", presented in 1967, gives figures for the supply of science graduates during the period 1960-64 and on the projected supply of graduates for the period 1966-70. Although the introduction to the report states "the tables relating to the supply of graduates indicate a grave deficiency in many branches of science of vital importance to our primary industries" the extent of this "deficiency" cannot be ascertained from the report since no estimates are given for the country's requirements for science graduates.

The report implies that there should be an increase in the supply of biological scientists, particularly in the experimental biologies. A striking feature of the report, however, is the clear indication of how high a proportion of our science graduates are trained as physical scientists. The projected total honours graduates in science available for New Zealand employment during the period 1966-1970 number 755, of which 545 will graduate in the physical sciences and only 210 in the biological.

Most New Zealand universities' science faculties differ little in character from the science faculties of Australia, Britain and many of the American universities. They show a strong emphasis on the physical sciences and a high proportion of the graduates have qualified in physics, chemistry or mathematics. For the overseas universities, the emphasis on physical sciences is to be expected, for the countries mentioned have economies based to a large extent on secondary and tertiary industries. For New Zealand, however, where our overseas earnings are based almost entirely on primary industries, it is surprising that our university science faculties do not reflect a national character. It could be anticipated from the nature of New Zealand faculties that there is an imbalance in the production of science graduates with proportionately too many physical scientists being trained and too few experimental biologists. The statements by one Cabinet Minister who referred to the numbers of nuclear physicists being trained, and by another who implied a shortage of biological scientists, suggest this imbalance.

At Massey we have established a science faculty in which degree courses in Biochemistry, Physiology, Microbiology and functional biology courses in Botany and Zoology were introduced. In addition, intermediate courses were designed which gave Chemistry and Mathematics students an introduction to modern concepts of experimental biology.

Although these courses have been planned to produce science graduates of special value to New Zealand, the correction of an imbalance in the training programme for scientists on the national level takes many years if it depends solely on a changing emphasis through undergraduate courses. Especially is this so when the decision as to which science courses a first-year student takes will depend to a large degree on his performance in upper sixth courses. At present, upper sixth science is predominantly physical science, with only a recent introduction of a modern biological science prescription which can be taken for the Bursary and Scholarship examinations.

While it is desirable to pursue a policy for a more "national" character for science education, starting in the secondary schools and continuing through the university science faculties, a more immediate solution to the imbalance problem could be found in a graduate programme.

So far, no university in New Zealand offers the possibility of a graduate being converted to another discipline at the post-graduate level. To proceed to masterate studies in our science faculties, a student must have taken a third year undergraduate course in the subject which he wishes

to study for the master's degree. This is an inflexible and unnecessary restriction on possibilities for graduate study. In overseas universities (e.g., Oxford), it is possible to take a different subject at the graduate level and in fact be equipped for effective scientific work in a different field. If New Zealand is training too many physicists or chemists, then a rapid correction of the imbalance could come from the introduction of graduate courses in, say, biophysics and biochemistry to produce graduates of immediate value in New Zealand's development.

We are looking into the possibilities of introducing such graduate conversion courses at Massey but for them to be effective they will need to result in our producing a "converted" graduate acceptable to industries such as yours.

May I conclude these few remarks with the hope that at some stage during your Conference some thought will be given to the source of future recruits to your ranks and suggest that many could come from what at present appear most unlikely fields of university training.