

Lincoln College



ANNUAL
REVIEW

1966

UNIVERSITY OF CANTERBURY

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NEW ZEALAND

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CHRISTCHURCH

PREFACE

THIS year *Annual Review* contains several articles of topical interest and reports on research work in progress. The Principal, Dr M. M. Burns, reports on the year at Lincoln, and the introduction of the semester system and the development of halls of residence are discussed by Mr Richard Heine, Lecturer in Physics, and Mr Brian Douglas, Master of Halls.

The purchase of Hunua, a hill-country property in North Canterbury represents a new venture in the College Farm Programme and is described by Dr J. D. Stewart, Professor of Farm Management. The remaining article reviews the work of the Rural Education Department.

A. T. G. McARTHUR

Senior Lecturer in Rural Education

EDITOR

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THE YEAR AT LINCOLN



DR M. M. BURNS

Principal, Lincoln College

BROADLY speaking, the College bulged at the seams in 1966: many lecture rooms were overcrowded, laboratories were really put to multi-purpose use, office accommodation for staff and residential accommodation for students were quite inadequate, and the organisation of class field trips had to be planned with the precision of military manoeuvres. On the other hand, the steady progress being made in the building of the new Teaching Block and the approvals given for other projects made it easier for staff and students to put up with the difficulties and problems experienced.

ENROLMENTS

At mid-year the number of students taking regular full-time courses was 11% above 1965 at 638, almost equally divided between degree and diploma courses. The rate of increase in the roll, which has exceeded all estimates, introduced difficulties in the provision of adequate lecture and laboratory facilities and complicated the organisation of field trips which are an essential feature of many courses. The major increases were again in the first year intakes for the Bachelor or Agricultural Science and the Diploma in Agriculture.

A heartening feature was the fact that 20% in the degree courses were enrolled for post-graduate qualifications.

The representation from eighteen overseas countries was 71, the majority of whom were recipients of various scholarships.

Additional to the 638 students taking courses of two or more years there were 240 enrolled in special courses in Woolclassing and Meat Inspection.

ACADEMIC DEVELOPMENTS

In 1966 the Council appointed to a personal chair Dr J. W. McLean, formerly Associate-Professor and Head of the Department of Veterinary Science. Several appointments were made to other positions but difficulty was experienced in attracting suitably quali-

fied applicants in certain fields. The new salary scales approved late in the year will assist in staff recruitment.

During the year the Professorial Board gave consideration to the structure and coverage given in all courses but only two major policy decisions were taken which will apply as from 1967. The first was the introduction of Agricultural Engineering, taught at this College as a full option in the Bachelor of Engineering courses offered by the University of Canterbury. The second was to change the course for the Diploma in Horticulture, for which all entrants in future must have had at least twelve months' practical experience as well as appropriate academic qualifications.

The Council approved a proposal to introduce in 1969 a post-graduate course in Landscape Design.

PHYSICAL FACILITIES

The year 1966 was one in which much effort had to be devoted to temporary measures to meet the needs for the teaching of classes larger than those for which the present facilities are suitable. Although the Hilgendorf Wing of the new teaching block is due for completion in July next the difficulties experienced in 1966 will be accentuated in 1967. The Hilgendorf Wing was planned on the basis of a roll of 560, which number is considerably less than the roll in 1966. It is clear that to cater for the larger roll and to provide space for those departments not included in the first wing it will be necessary to build a second smaller wing parallel to the first.

The first building—a workshop block—for the Agricultural Engineering Institute was completed during the year and plans were finalised for an administration and laboratory block. As the Department of Agricultural Engineering must also be provided with additional teaching space there would be merit in combining the needs of the Institute and of the Department and this is under consideration. Approval was also obtained to build during the summer the first stage of a new workshops block so that one section could be set up for temporary use over the next two years as a lectureroom for large classes.

Progress was made with planning of the other buildings listed in the 1965 report but none reached the stage where tenders could be called. This is particularly unfortunate with regard to the two large residential halls, as the need for additional residential accommodation is urgent. In 1966 almost half of the students had to find accommodation away from the College and of this group the majority are from homes outside of Canterbury.

During the year further steps were taken on the setting aside of the central site of 140 acres for campus development. Decentralization of farming activities was advanced by the erection of a new house and outbuildings on the Mixed Farm, by the construction of a new herringbone dairy shed and by the transfer of a young orchard to the new site on the Research Farm. These steps which have been undertaken by the College itself have made possible further planning of the campus layout but final decisions on this must depend upon the future use of the best of the older buildings in the central area.

In 1966 the College transferred the former stud sheep farm to the Department of Scientific and Industrial Research and developed a new property on the west side contiguous with the Research Farm.

Possession was also taken of Hunua, a 2,300-acre property in North Canterbury. This property will be managed by the Farm Management Department as an experimental area to investigate management practices leading to full potential and to assess the economics of development.

RESEARCH

Funds for the research programme were again received from very many sources and though few new projects were initiated sound progress was made with the wide range of projects being conducted by the various departments.

The Agricultural Economics Research unit published a further twelve reports on a range of topics. This unit, funded by a grant through the Department of Scientific and Industrial Research, is stimulating interest in advanced training in economics as well as making a very effective contribution to the national research programme.

One very serious problem which arose during the year was the sharp restriction placed on access by College persons to the computer at the University of Canterbury. This decision, which was made necessary by the growth of demand within the University, forced the College to make alternative but more costly and less effective arrangements. The help extended to the College by the University was much appreciated but the situation which developed highlighted the need for the College to have its own computer for research and advanced teaching.

Though the Agricultural Engineering Institute funded through the Department of Agriculture made the testing of safety frames for tractors a major interest, work was also initiated on a number of

other projects in farm machinery. By the end of the year appointments had been made to all professional posts approved.

Collaborative work in endocrinology between the Animal Science Department and the Medical Research Unit at Princess Margaret Hospital was continued.

Special research equipment purchased from a Golden Kiwi lottery grant was brought into use for Soil Science studies.

EXTRA-MURAL ACTIVITIES

It has always been College policy for the staff to maintain close liaison with the community and in 1966 the staff participated in the regular field days, conferences and in the preparation of bulletins and radio broadcasts. Requests for the staff to take part in conferences held throughout the country were so numerous that it was necessary to limit acceptances in preference to interfering with the teaching programme.

The year 1966 was more one of consolidation following upon the important decisions of 1965 than one of major development. Highlights were the increased intake of students, the progress on the new Teaching Block, the development of the campus including the erection elsewhere of replacement farm buildings and the increased support given to the research programmes.

THE SEMESTER — A LINCOLN EXPERIMENT



RICHARD W. HEINE
Lecturer in Physics

THE university year in New Zealand is divided into three terms, in a similar manner to that of British universities. Such a division is not, however, by any means universally adopted, and as early as the last century German universities were operating on a six-monthly division of the year. Each division was called a semester, a word taken from the Latin. Nowadays this word and the system it represents is associated in the minds of most people with university education in the United States, although it is not by any means universally used there. Harvard, for example, refer to their two terms merely as the Fall and Spring Terms, and some universities have gone one better with trimesters!

In 1965 Lincoln College introduced a semestral system into its first-year degree course, and in 1966 extended it to the second year. To bring this about, the four subjects previously taken in each of those years were split into two groups. In the first half of the first year Zoology and Physics were studied; in the latter half of that year Botany and Chemistry. For the second-year students, Plant Science and Animal Science came first; Soil Science and Economics second. To compensate for the reduced time available, the number of hours per week devoted to each subject was doubled.

From the staff point of view the big advantage of the semestral system is that half of the academic year can be devoted to teaching and the other half to research. Having only part of the degree course in semestral form, and none of the diploma, has meant naturally that not all staff have been able to enjoy this benefit to its full advantage. However, by staggering the times of staff involved in more than one course, so that for example a person teaches for the first three months of one semester and the last three of another, most of the benefit can be retained. Rising staff numbers make this less of a problem as time goes by.

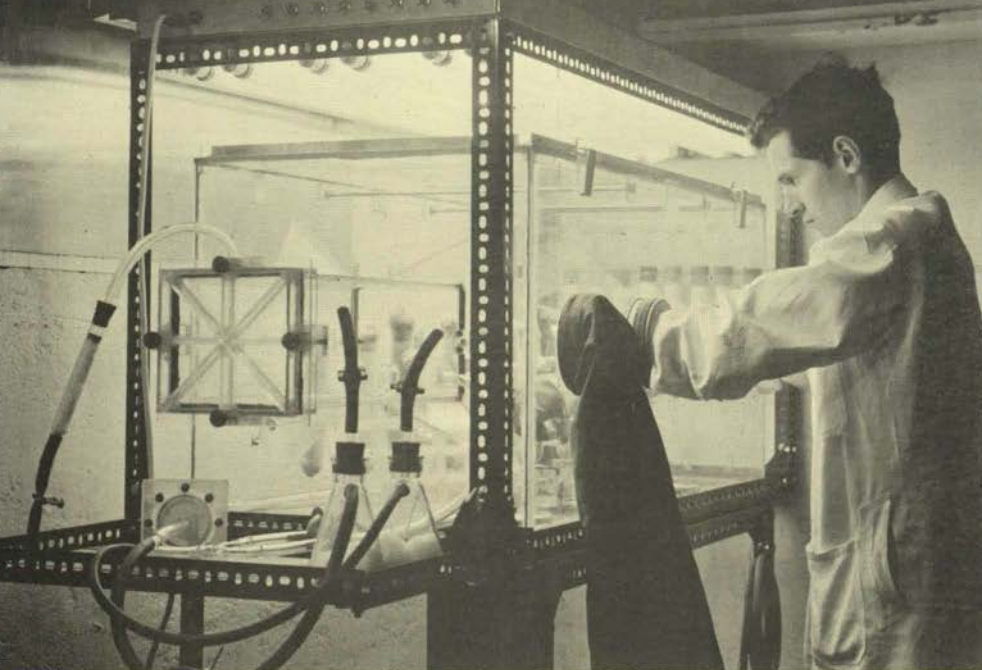
From the point of view of the students, the big advantage of the semestral system is that it permits them to concentrate their energies in only two directions at once, instead of four. It also forces them to work regularly throughout the year. Last August the students devoted the front page of their newspaper *Caclin* to a thoughtful discussion of the value of semesters. They concluded by saying that students who had experienced the system were greatly in favour of it, and that students straight from school received benefit from intensive early work leading to mid-year final examinations. Few university teachers would disagree with the last remark.

Staff reaction has been more varied. Some feel that certain subjects which require conceptual development cannot be compressed, but whether the argument is valid is not settled. The results of the Physics course suggest otherwise. It is probably fair comment to say, though, that it is more difficult for adequate reading to be done in a subject when it must be covered in half the time. The amount of written work set may be limited too, by the lack of time needed to correct it. The problem has been raised of those biological and applied subjects which need a complete year to cover a breeding or growing cycle or those who wish to illustrate pasture conditions at different times of the year. There is no reason, though, why a subject cannot be taught throughout the year within a semestral course system. It is merely a matter of having an examination half way through the year to test that half of the work.

The staff are unanimous that the semestral system has not lowered the performance of the students. Certainly most feel that it has in fact raised the standard of attainment in their own subjects. Fluctuations in the average ability of a particular intake inevitably cause annual pass rates to vary slightly. Pass rates are therefore not necessarily an indication of the success or otherwise of a new system, until they can be averaged over a number of years. One must at this stage rely on the subjective impressions of the teachers concerned, and on this basis the system has been a success.

Bearing in mind the possible disadvantages outlined above, and coupled with the attitude of some that the system should be allowed a longer period of trial in its present form, Faculty decided not to seek extension of the semestral system into the third year in 1967. It should, I think, be added in all fairness that those of the above turn of mind have had little or nothing to do with the present semester programme, so that the Faculty decision has in fact merely reflected the conservatism that is always present in a university.

Whether or not Lincoln College will eventually adopt a degree structure which is partly semestral, or whether it will proceed to a



RESEARCH AT LINCOLN

This sterile culture cabinet is used to grow pine seedlings for nitrogen fixation experiments.



A nitrogen analyzer allows the nitrogen content in biological material to be determined.



THE REFECTORY HALL IS THE COMMON MEETING GROUND FOR STUDENTS

This photograph was taken in vacation time when the College is occupied for conventions and courses.

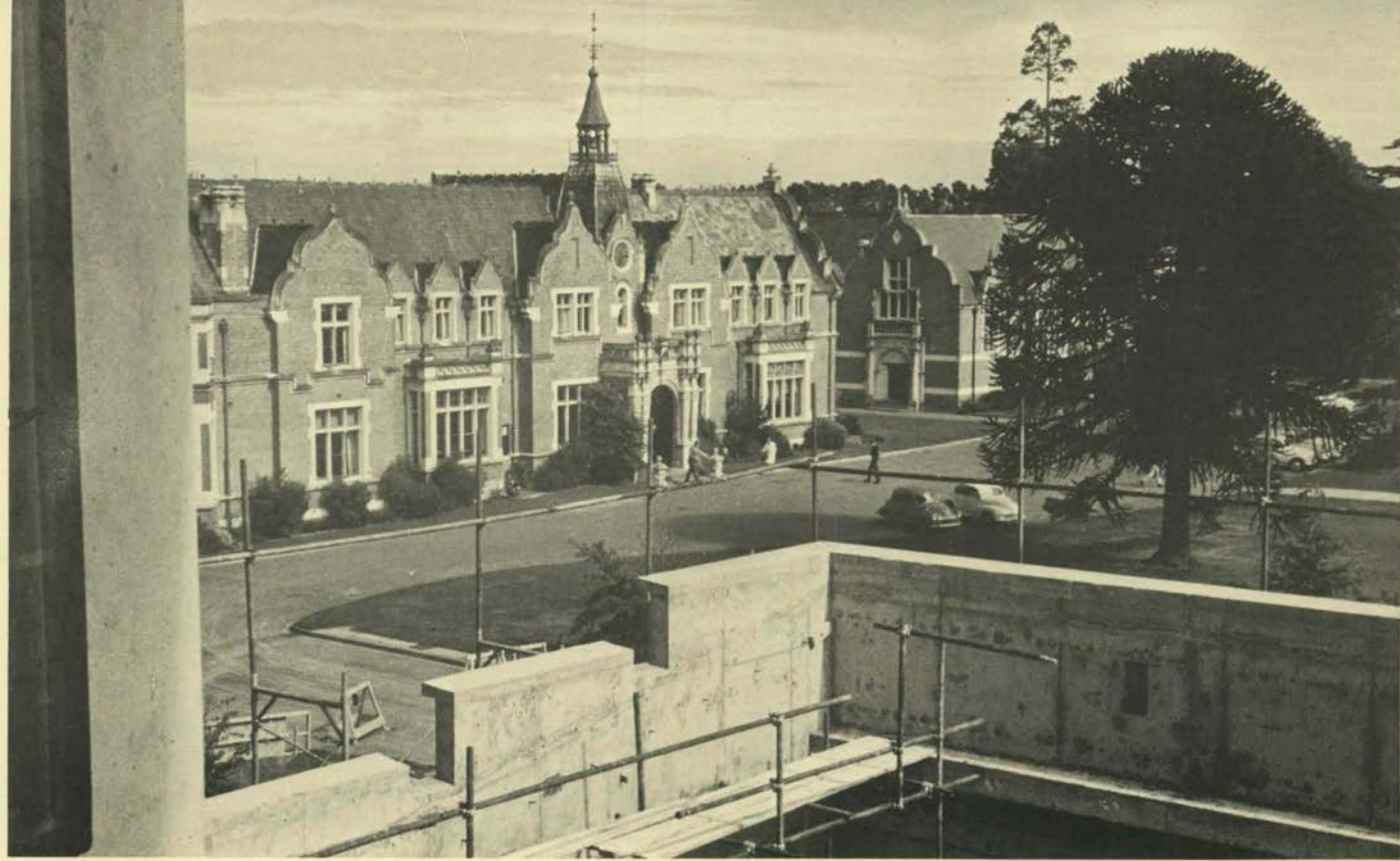


THE GEORGE FORBES MEMORIAL LIBRARY

A view of part of the main reading room.



LUNCH-HOUR RELAXATION IN THE SUN



A VIEW OF IVY HALL FROM THE HILGENDORF WING UNDER CONSTRUCTION

full semestral system remains a moot point. There are no internal problems in the way of the latter, but there are external factors which it may not be possible to ignore entirely. At present both our primary and secondary schools operate on a three-term system and lecturers with children of school age may wish to take vacations at the same time as their children. Of course they may not! Pressure from commerce to stagger holidays may, however, alter the school pattern of terms within the next decade and, in any case, the greater flexibility of the semestral system gives it advantages, particularly with the ever-increasing specialisation of courses, that no university can afford to ignore.

RESIDENTIAL STUDENT ACCOMMODATION



B. DOUGLAS
Master of Halls

UNTIL 1960 Lincoln College was effectively a fully residential College; with the Principal granting permission for students to live away from the College. Since then the number of beds available has remained about the same but the student roll has doubled. In 1966 among students studying courses of more than one term's duration, there were 287 who lived away from the campus and 347 or 55% who lived in the Halls.

The accompanying graph (Fig. 1) indicates the way in which the student numbers have increased and shows estimates of numbers in the immediate future. It is hard to realise that the number of students enrolled at the College since 1953 is greater than the number who attended the College in all the years before then and quite staggering for staff to consider the prospect of a College roll doubling again in less than ten years.

Dr Blair, in the history compiled for the 75th anniversary of the College, points out residence at Lincoln as an important and "wonderful" human experience. The statistics above and consideration of the changes involved since the 75th Anniversary, the year when students ceased doing their practical farm work on the College farms, makes one wonder whether the historical experience and traditional attitudes at Lincoln have any bearing on the present situation. The old authoritarian direct discipline of Director and house-masters, the personal feuds, the poor conditions of food and warmth outlined in the history would not be tolerated by the men in residence now. However, residential halls still provide opportunity for making friends, opportunity to serve and belong to a community, opportunity to participate in a range of sporting and social activity and most important the opportunity for mutual discussion and mutual instruction with classmates in the subjects of the curriculum

and wider fields of interest. The halls provide adequate food, shelter and warmth and so long as they do so the less tangible but more valuable opportunities absorb student endeavours.

At Lincoln in 1966 the halls house the student union facilities, the cafeteria, the canteen, the billiards room, the games room, the TV room and the reading rooms for all students, residential and non-residential. The dining room and College Refectory providing up to 1,400 meals a day in the winter term is truly the centre of our domestic life even though formal dinners are hard to arrange and the sharing of common meals informally adds considerably to the collegiate feeling evident at Lincoln. The future developments on the campus should recognise the integral part played by residential students in student association affairs and try to retain the intimacy between the union buildings and the residential halls. If this is done the benefits of a residential college will be available to both those students in residence and the commuters.

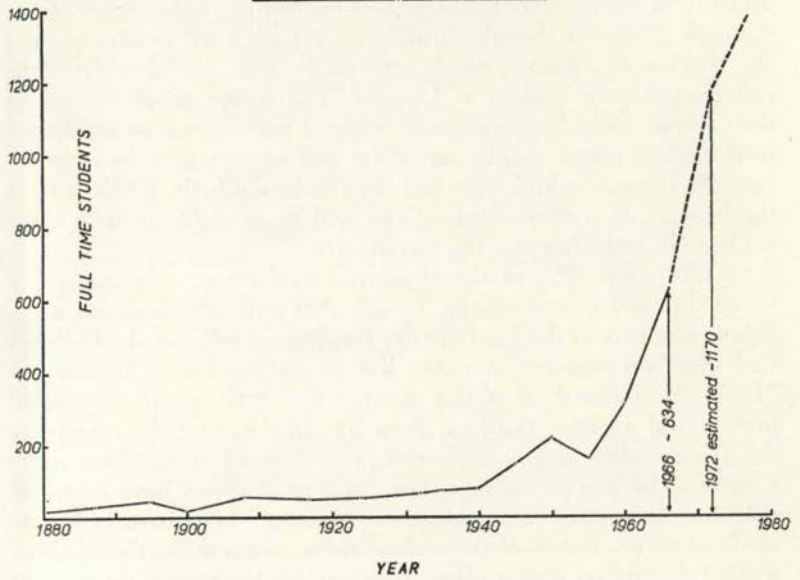
In 1966 some 45% of the registered students are commuters. A survey of their accommodation reveals that only sixty beds are available to students in the local district (within six miles of the College) and most non-resident students live in metropolitan Christchurch (180). About one-third of this number live in their own or parents' homes, and about a third of them live in flats and the remaining third live either as paying guests with friends or relatives, or as lodgers. The accommodation non-resident students have found to date has been more than adequate; most of them have bedroom-studies and a very few of them share these rooms with others. About a third depend on their College refectory for their main meal of the day and at least a third depend on the College bathrooms for showers and do their washing with the students' association equipment in the College ablution blocks (at no charge).

The boarding charges at the College in 1966 are £6 per week. If transport costs are included, students in flats shared with three or four others can live more cheaply than that while students in lodgings in Christchurch with transport may pay a few shillings more.

Transport is a very big item in student budgeting; over 400 cars belonging to students are registered for parking on the campus in 1966. The mobility of students has a marked effect on life within the halls enabling resident students to take part in an active social life in Christchurch and making it possible for non-residential students to take part in any student activities they wish irrespective of bus timetables.

Lincoln College in 1966 is still a residential College; partly by

GROWTH OF STUDENT NUMBERS



tradition, partly because the halls provide all the student amenities and partly because over half the students actually live in.

In 1967 less than half the students will live in and unless new halls are built by 1969 two-thirds of the students will be commuters.

There is no evidence yet that student numbers will fall off because students cannot live on the campus nor is there evidence that students are finding the conditions in big classes so difficult that they are leaving, but it is reasonable to suppose that unless the College builds more halls and adapts either the methods of teaching or the size of classes stresses will start to show first by an increase in the number of students who discontinue their courses after starting them and then by a fall off in the rate of registration for courses.

In this discussion we are not concerned with the difficulties in teaching large classes but with student accommodation. However, my personal views are that there is an adaption to the diploma course which would go a long way to solving both problems, i.e. to have Diploma I and Diploma II attend their course at different periods of the year. This would double the number of diploma students who could be offered residence and facilitate the handling of large classes. However, the suggestion is a radical one—unacceptable to many, including the Rugby Club! It does indicate, however, that adaptations are possible and that it is a luxury to have beds unoccupied by regular course students for more than half the year.

Notwithstanding any adaptations which may be made to the course structure the College is faced with the urgent needs to accommodate increased student numbers

- (a) to provide more beds
- (b) to provide in a student union, facilities for sport, recreation, gymnastic, cultural and social activities
- (c) to provide more study space for non-resident students.

The problem of providing study space must ultimately be solved by the library and the intermediate stop gap facilities need not concern us, though it is interesting to note the number of non-resident students who "borrow" study space from their friends in residence during the day time.

The plans for the provision of more beds and to provide the necessary facilities of a student union are tied to the success of the appeal for funds which will be made in 1967. The appeal is for £150,000.

The Students' Association has been taxing its members for five years and now has £14,000 accumulated which has given them confidence to draw up plans for a much-needed gymnasium. The College has set aside funds for the building of a large Conference hall—

to be built to the memory of the Hon. W. H. Gillespie—and has started accumulating funds for new halls. The resident students are now levied for building replacement and, along with their own gymnasium levy, each student is contributing some £15 per annum toward the provision of buildings.

The need for future accommodation must be met. The College administration and the Students' Association are accumulating funds and plans have been drawn up for

- (a) two new halls of residence (160 beds approximately)
- (b) motel type of accommodation for senior students (30 beds approximately)
- (c) a gymnasium.

The indications are that about 70% of students want to have accommodation on the campus and that so long as 60 to 70% live in residence the College will maintain its essentially residential character. There appears to be no need to try to regain the *one hundred per cent residential* situation which has no special advantage and would be difficult to attain. However, to regain 70% residential situation which appears a reasonable and practical goal will require the completion of 170 beds by the end of 1968 and at least 70 beds each year thereafter.

The halls designed to achieve this expansion will be built so that each group of twenty men will have a common stairwell and it is hoped the "battery" atmosphere of long corridors will be avoided. Fortunately the College Refectory can be expanded to take about twice its present numbers without too much costly alteration.

In addition "motel" type accommodation will be built for senior students. The first unit will be in memory of Associate Professor H. E. Garrett. The concept behind this type of accommodation is the need for seniors to get away from the herd in the big hall; a need which is revealed in most universities by the senior students taking flats and leaving the halls. We hope that by providing such accommodation on the campus they will remain so that their maturity will influence the juniors. Our experience with a few old houses which are on the campus and have been let in this way indicates that it is a much sought after privilege to be admitted as a resident to these houses.

TEACHING AND RESEARCH IN EXTENSION



A. T. G. McARTHUR

Senior Lecturer in Rural Education

THE Rural Education Department was established in 1966 at Lincoln under Associate Professor L. W. McCaskill. As the name often confuses people within and outside Lincoln, this article aims to establish greater understanding of the nature of the subject and its role in the farming industry.

Extension is the main branch of Rural Education which interests us at Lincoln. This article will explain what Extension is, how it is taught and the field of research engaged in at Lincoln. Because of limitations of space, this article will not discuss the many other operations with which the Rural Education Department is involved—conference, courses, field days, radio and press coverage—nor is there space to outline the counselling work undertaken with young people entering the farming industry.

At the moment New Zealand has a development plan for agriculture with targets of annual increase of four per cent in ewe equivalents per year. There are various options which a country has in order to stimulate development of this kind. It can change the taxation laws to encourage farm investment and make the net gain from development more attractive to farmers. It can introduce subsidy schemes to lower costs and raise prices—the procedure used in the U.K. Then it can make capital and credit available to the farming industry for development. It can also spend money on research in order to evolve new methods which lower costs and which raise production.

However, all these options are unlikely to have their full impact unless there is a strong advisory service which can sift knowledge for farmers and recommend to them those ideas which they can adopt with advantage. Thus an essential option in any development scheme for the farming industry is a strong advisory or extension service. Unless research results and farmer-developed ideas are used

by the farming community they have no value. Farmers must be aware of the credit available to them and how to use it to their advantage by investing in high priority farm projects. Taxation incentives are likely to be of greater value when associated with an extension programme which explains their use.

In New Zealand our agricultural development plan includes the expansion of the Department of Agriculture's Farm Advisory Division and the N.Z. Dairy Board's Consulting Officer Service. Further, there is a growing demand by farmers for Farm Improvement Clubs. Both Lincoln and Massey are providing the graduates for these extension services and clearly it is necessary for them to have the training to work efficiently in the field of extension.

Now extension is an educational process which changes the knowledge, attitudes and skills of farmers with the aim of changing the methods farmers use in order that their welfare can be raised. Because extension is a branch of adult education applied to the farming community it is called Rural Education at Lincoln. Thus good extension officers do not tell farmers how to farm better—farmers themselves learn new methods as a result of interaction with extension. In general, Farm Advisory Officers do not tell farmers how to manage their farms better, but as a result of consultation with their adviser and through contact with other progressive farmers, the farmers improve their skill in management. Only in special cases do Farm Advisory Officers actually manage farms for their clients or tell them what to do.

Having defined extension as an educational process and shown its place in the farming industry this article will describe the teaching and research which the Rural Education Department undertakes at Lincoln.

On the teaching side, only degree students study Rural Education. There are two courses, a compulsory half-year's course in Extension Methods in the third year of the degree and two optional papers in Rural Education in Degree IV.

The extension methods in Degree III course aim towards students' understanding and becoming skilled at methods of communication. The procedures recommended are based on communication theory and learning theory. The course covers communication by writing and speaking. Students learn and practice public speaking, radio broadcasting, writing for newspapers, writing articles and reports. The course also covers the place and procedures for various mass, group and individual extension methods.

The essential part of this course is the practical classes. For instance, in the course each student has to give several short talks.

The others in his group criticise his performance constructively. Even those who are experienced public speakers improve their performance. While there is not sufficient time to ensure that every graduate from Lincoln is a first-class communicator, at least they know how to communicate, where their deficiencies lie and how to improve performance with future experience.

Rural Education in Degree IV focuses on the planning of Extension. The purpose of planning is to determine the optimum mixture of methods which lie within the resources available in order to maximise the response required.

Now in order to build an effective extension plan it is necessary to have an appreciation of the technical, economic, and human situation in the country or district in which extension is operating. While graduates have the technical and economic training, they lack the background to assess the human situation. Consequently there is a course in Rural Sociology and Adult Education as one paper in the fourth year. In selecting appropriate extension methods an understanding of sociology is particularly important for overseas students who are showing an increasing interest in this field of study.

The other paper offered by the Rural Education Department to Degree IV students is called Agricultural Extension. This course focuses on extension planning—decision, scheduling and evaluation. Under evaluation students learn the techniques of making farm surveys, sampling, questionnaire construction, preparation of measurement scales for knowledge level and attitude. In evaluation the purpose is to measure the response from an extension programme. Also, this course includes material which will aid graduates who enter Extension as a job to sift the information available to them for their farmers. For instance it is important to understand how to test recommendations to see whether or not they should be advocated widely.

The courses briefly outlined here have been orientated towards the needs of an extension organisation. However the graduate entering an organisation may have difficulty in applying his training if it is not understood by his superiors. Consequently the Rural Education Department originated short courses for officers of the Farm Advisory Division of the Department of Agriculture on extension methods and planning four years ago. These are now organised by the Department of Agriculture and run by the author and Mr Alan Hughes, Senior Lecturer in Agricultural Extension at Massey University. Over half the Farm Advisory Officers have now been through the extension methods course but it appears that this course will be in

demand for several years from those in other divisions of the Department as well.

These courses are not only helping to increase the effectiveness of the Department of Agriculture but they provide the lecturers with direct information on the empirical value of the teaching.

The Rural Education Department has a research programme much of which is associated with the Agricultural Economics Research Unit. Because of our interest in the human situation in the farming industry, the Department undertook an investigation of the farm labour position in Cheviot county. Dr R. G. Cant, now of the Geography Department, University of Canterbury, worked as a temporary lecturer in Rural Education during 1966 while Mr D. B. McSweeney was away lecturing in Malaysia. He and Mr J. Morris, who was employed by the research unit, undertook the work. They found that farm workers in Cheviot had comparable wages to skilled workers in town. However, there was a shortage of married workers and they were able to make useful recommendations for this problem. Dr Cant is continuing with the work. He has measured the factors which are associated with satisfaction and dissatisfaction of single farm workers (wages rather than social factors appeared pre-eminent) and he is now finding out from workers who have left farms why they left the land.

The Department has made a study of extension operations on Banks Peninsula. Here the Department of Agriculture based an extension programme on a demonstration farm. The first step was to determine the profitability of farm development from this and another case history using cost-benefit analysis. The margin from development was highly profitable both from the national and individual points of view even when pessimistic assumptions were made about prices.

The next step was to evaluate the amount of information which had been transmitted by the Department to farmers. This was measured by a sample cross-sectional survey. The amount of information transmitted was disappointing; farmers had absorbed very little of the quantitative recommendations or the economic information. Except for the younger farmers the underlying factor in lack of absorption appeared to be satisfaction with the present state of farm development and consequently the information was irrelevant for them.

Further work is now being done in Northland under a grant from the Commercial Bank of Australia. While this project has wider economic implications, one of its aims is to determine the priorities for extension organisations. One of the questions to answer is this:

given limited extension resources, what kinds of farmers (sheep or dairy farmers, citrus growers, land developers) should be given priority in extension planning? The criterion to answer this question can be obtained, in part, from a cost-benefit analysis of various kinds of farm development. Data from case histories of fast development have been collected. It is hoped that preliminary reports of this work will be issued during 1967. Mr K. D. Sanderson, research officer of the Agricultural Economics Research Unit, has been assisting in this work.

Because computers are likely to play an important role in the work of farm advisory officers the Department has been interested in the construction of programmes that will increase the effectiveness of this work. For instance a programme has been written for calculating development budgets for dairy farms. Another programme is available for cost-benefit analysis work of the kind mentioned above. Further programmes have been written to analyse cross-section farm survey data which is currently being used by the South Canterbury Agricultural Development Council.

The Rural Education Department's main aim is to raise the effectiveness of extension and advisory work in New Zealand by teaching and research, and hence raise the value of the farming industry to the country.

PLANS FOR HUNUA



DR J. D. STEWART

Professor of Farm Management

EARLY in 1966 the College took a further step into practical farming, this time off the Plains on to a steep and rugged piece of country in North Canterbury. The College, of course, has always "owned" tussock country, in the form of its high-country endowments in the Hakataramea Valley and in the Rangitata gorge. But it has never farmed this country, in the sense that it farms its holdings at Lincoln. Thus when a decision was made to dispose of some of the endowment land, it was thought desirable to put some of the money into a hill-country block.

The property purchased is on the Doctor Range, west of Waikari and south-east of Hawarden. It comprises 2,282 acres of steep, unimproved country, which rises to 2,100 feet at the highest point. The name "Hunua" translates to "high, infertile land", which most visitors would regard as appropriate. The rainfall is thought to be about twenty-five inches, and a proportion of the country is exposed to the north-west, which is particularly desiccating in this area. However there is quite a good balance of easterly and southerly country.

The property is ill-shaped. It is long and narrow, with a bottleneck about one mile from the homestead, which is located at one extremity. It opens out somewhat to a back-boundary which is about six rugged miles from the homestead. At the time of purchase there were no access tracks, and the subdivision was into four blocks.

The cover is most variable. There are areas of good silver tussock on the tops and easier slopes, the sunny country carries a poor overgrazed cover of danthonia, while the steep dark faces and gullies carry flax, some fern, matagouri and other shrubby weeds. However, while there is also some nasella tussock, nodding and Grecian thistle, the weed situation is not as severe as it may sound. There is ample evidence of resident clover over quite substantial areas of the country.

The soils are mainly sandstone based, phosphate and sulphur deficient but with reasonable pHs. There is also an interesting block

of volcanic-based material, exhibiting high phosphate and low acidity, but markedly sulphur deficient.

The existing stock, 1,000 Corriedale ewes and 350 replacement ewe hoggets, were taken over by the College. These are low performing sheep, the lambing this year has been 76%, and the expected wool weight is less than 8 lbs from the ewes, the hoggets having clipped 6 lbs. Body weights of these sheep have been extremely low, which is clearly related to the nutritional level, and perhaps to some additional deficiency.

It is evident that we have taken on something which is pretty challenging. What are our objectives?

In the first place it is to be an exercise, designed to explore the management problems and the economics of developing this class of country. It is characteristic of large areas in North Canterbury and elsewhere, burdened by the dreary cycle of sparse and unthrifty clovers, low stock and poor nitrogen turnround. Neither the stock nor the country have much resilience in the face of periodic semi-drought conditions. Thus we do not expect to be able to achieve the spectacular results being obtained on hill country in more favourable areas—with reliable summer rainfall, and moderate winters. Nevertheless we have started on a development programme which we believe will yield good results. If it turns out to be profitable and economically viable, we will have learned much. If it doesn't we will also have learned something. And whichever way it goes it is our intention to publish all details.

In order to make the financial aspects realistic we are assuming:

- (a) that there is a realistic mortgage to service, over and above the rent
- (b) that it is not possible to borrow more for development than could be obtained through a normal State Advances development loan
- (c) that overdraft facilities are limited.

The programme for the first year is well under way at the time of writing, a £4,000 development loan having been raised. This has been allocated to:

- (a) a second-hand tractor and a motor-bike
- (b) access track and culverts
- (c) fencing
- (d) oversowing and topdressing.

The response to the initial oversowing and topdressing has been very encouraging, although this has been assisted by a favourable

growing season. Nevertheless it has given us encouragement to proceed with an extended plan for 1967. Stock increases will take the form of dry sheep. The extremely low condition of the ewes and their low performance gives little scope for using them to "work" the country, so the aim is to build up a wether flock for this purpose.

Already the property has made a significant contribution to the teaching programme of the Department of Farm Management. Other Departments, in particular Animal Science, Plant Science and Soil Science, have active research projects under way at Hunua. It is clear that the property is going to make an important contribution to the work of the College. It is being jointly supervised by J. D. Stewart and A. I. Bilbrough.

RESEARCH IN PROGRESS



AGRICULTURAL ECONOMICS

(AGRICULTURAL ECONOMICS RESEARCH UNIT)

1. MARKETING ECONOMICS

Price and Income Elasticities of Demand for Meat and Dairy Products in Great Britain, B. P. Philpott, M. J. Matheson

Estimates of regional elasticities have been derived and the implications of regional differences for promotion policy are being studied.

Long-Term Projections of Overseas Demand for New Zealand Meat, B. P. Philpott, M. J. Matheson, D. R. Edwards

Projections are being prepared for Great Britain, E.E.C. countries, U.S.A. and Japan.

Price and Income Elasticities of Demand for New Zealand Wool, B. P. Philpott, M. J. Matheson

An econometric model is being developed to explain short-run speculative fluctuations in prices and a simulation study of marketing has been commenced.

Long-Term Projections of Demand for New Zealand Wool, B. P. Philpott, M. J. Matheson

Trends in retail consumption and exports of wool textiles are being analysed for each of twenty-one major consuming countries. Individual country analyses will be used to project demand levels in 1970.

Economics of Private Wool Selling in New Zealand, L. D. Woods

An evaluation of the role of private wool dealers, the advantages to farmers of selling wool by this method and the returns achieved. A survey of all dealers is being conducted.

Demand for Pigmeat in New Zealand, C. A. Yandle

Time series analysis and a questionnaire survey are being used to establish factors affecting consumption of pigmeat. Long term projections of demand will be formulated. A critical analysis of marketing methods is also being conducted.

Optimum Location of Vegetable Processing Plants, K. D. Sanderson

A linear programming model is being used to establish optimum location of new tomato processing plants in relation to raw material supplies and costs and size and growth of markets.

Econometric Techniques for Demand Forecasting Projection, R. H. Court, M. J. Matheson

Methods are being derived for estimation for groups of commodities of elasticities and cross elasticities subject to restrictions derived from demand theory.

2. PRODUCTION ECONOMICS

Economics of Hill Country Development, R. W. M. Johnson, D. D. Hussey

This project is designed to measure the profitability of hill-country development and to assess the economic impediments which prevent farmers from embarking on development programmes and to suggest measures needed to overcome these impediments such as tax policies and financing arrangements. The profitability of development on a group of Meat and Wool Board Economic survey farms has been studied and a survey of Taranaki hill country farms is being made.

Economics of Large-scale Land Development, E. D. Parkes

A Cost-Benefit Analysis of development of Hindon Block.

Economics of Beef Production in Hawkes Bay, D. B. McClatchy

Linear programming studies of profitability of beef on some Hawkes Bay hill farms.

Economics of Farm Labour, J. L. Morris, R. G. Cant, A. T. G. McArthur

A survey of farm labour problems in Cheviot County has been completed and is being analysed.

Economics of Fertiliser Use in Southland, R. C. Jensen, A. C. Lewis

Economic analysis of case studies and survey farms.

Economic Implications of Agricultural Development in Northland, A. T. G. McArthur, K. D. Sanderson, B. P. Philpott

The aim of this project is to assess the agricultural potential of Northland: to calculate the profitability of development and the overall economic implications for the area.

Survey work in the area is proceeding over the summer of 1966/7 and will continue in 1967/8.

Econometric Analysis of Land Sale Prices, R. W. M. Johnson, D. D. Hussey

Development of models using data on land sales.

Long-Term Trends in Agricultural Productivity, B. P. Philpott

Trends in capital and labour use and the growth of efficiency in agriculture over past decades are being studied in order to elucidate the relationships between resource use and output achieved in the past. Time series production functions have been fitted to the data and results are now being prepared for publication.

Cross-Section Production Functions for a Sample of Sheep Farms, B. P. Philpott

Combined cross-section and time-series production functions are being fitted to a sample of 300 sheep farms from the N.Z. Meat and Wool Boards' Economic Service.

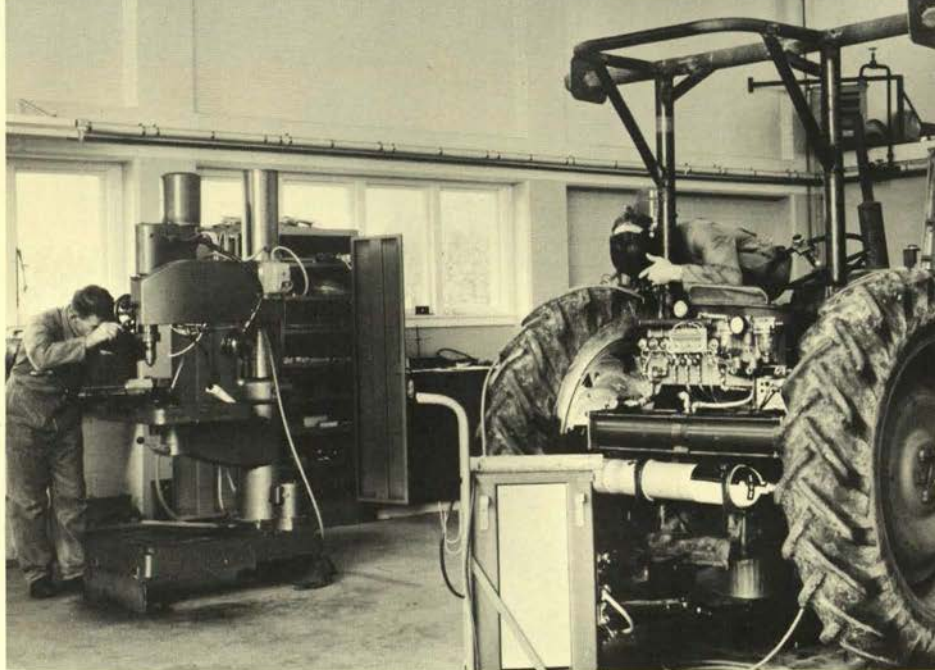
3. INTERINDUSTRY ECONOMICS

Development of an Eight-Sector Interindustry Table for 1964/5, B. P. Philpott, B. J. Ross, J. W. Francis

Using the 1954/5 and 1959/60 Statistics Department Input-Output tables, an estimate of the structure of the economy in 1964/5 and the trends in gross and net output, primary inputs, and final demand, is being prepared.

Capital Employment and Output by Sectors 1955-1965, B. P. Philpott, J. W. Francis

An analysis of the relationship between output, capital labour and technical

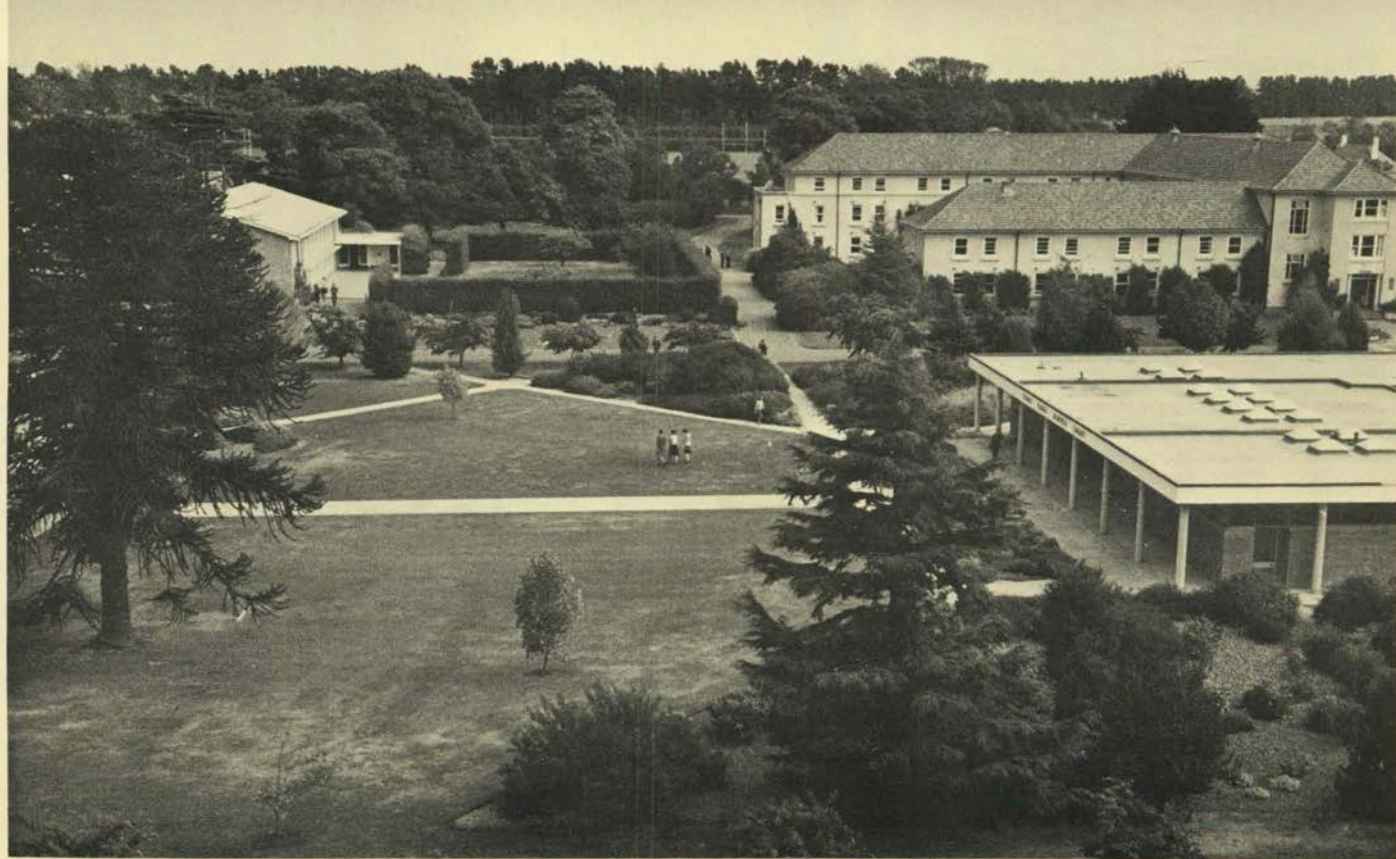


TRACTOR SAFETY-FRAME RESEARCH

As part of the safety-frame research programme, a remote-control tractor has been built in the N.Z.A.E.I. workshop.



The tractor is controlled at the end of a 100ft cable. Here it is being loaded on a trailer for transport to the testing site.



A NEW VIEW OF THE COLLEGE GROUNDS FROM THE HILGENDORF WING



WHEAT RESEARCH

Lawrence Olugbemi, a masterate student from Nigeria, transplants germinated wheat in an experiment to study the effects of temperature stress on growth.



INSTALLING LABORATORY EQUIPMENT IN THE
HILGENDORF WING



COLLEGE PARKING PROBLEM

Each year the increase in non-residential students means a demand for more space in which to park their cars.



LUNCHTIME: OUTSIDE THE HUDSON HALL CAFETERIA

change in each of eight sectors and for primary produce processing industries. Parameter values will be used for projecting future capital requirements. Estimates of capital employed in manufacturing has been completed and work is proceeding on other sectors.

Projection of Structure of N.Z. Economy to 1974/5 under conditions of four per cent Agricultural Growth, B. P. Philpott, B. J. Ross

Projections based on a pilot, four sector, model have been calculated and will be used as the basis for work in the larger model.

Indirect Employment Generated by Agricultural Production, B. P. Philpott, B. J. Ross

A pilot assessment has been carried out using a four sector model and the methods used will be incorporated in the work involving a larger model.

AGRICULTURAL ECONOMICS RESEARCH UNIT PUBLICATIONS

23. Philpott, B. P. and Matheson, M. J., "An Analysis of the Retail Demand for Meat in the United Kingdom".
25. Philpott, B. P., "Strategic and Tactical Planning in International Marketing Policies". (Reprint.)
26. Scott, G. C., "Indexes of Costs of Investment Goods. 1949-50 to 1963-4".
27. Ward, J. T. and Parkes, E. D. in association with Grainger, M. B. and Fenton, R. T., "An Economic Analysis of Large-Scale Land Development for Agriculture and Forestry".
28. Townsley, R. J. and Johnson, R. W. M., "A Review of the Argentine Beef Cattle Situation".
29. Philpott, B. P., "Aspects of Productivity and Economic Growth in New Zealand, 1926-64".
33. Holden, J. S., "The Economics of Hill Country Development". (Reprint Proc. N.Z. Grassland Assoc., pp.64-74.)
34. McClatchy, D., "Report on a Survey of Farm Labour in Patangata County, Hawkes Bay, 1965/66".
35. Frengley, G. A. G., Tonkin, R. H. M. and Johnson, R. W. M., "Programming Farm Development".
36. Philpott, B. P., "Productivity, Planning, and the Price Mechanism in New Zealand Manufacturing Industry".

Technical Paper:

1. Court, R. H., "An Application of Demand Theory in Projecting New Zealand Retail Consumption".

Theses:

- Acland, H. T. D., M.Agr.Sc., "An Analysis of the Demand for Carpet Wool in the United States of America".
- Ross, B. J., M.Agr.Sc., "Some Aspects of the Relationship between Agriculture and the National Economy, with special reference to Labour".

AGRICULTURAL MICROBIOLOGY

Studies on Rhizobium Nitrogen-Fixing Bacteria, I. D. Blair, Miss R. V. Shroff
(a) Screening trials have been conducted to measure the relative efficacy of 22 strains of *Rhizobium meliloti* on lucerne and 36 strains of *Rhizobium*

trifolii on white clover. The strains have also been examined in their tolerance of both low and high pH. Whereas most strains appear to operate in nodulation at pH 6.5-7.0, some have revealed a degree of success at pH 4.5-5.0. Evidence has also been obtained of sensitivity to the high levels of pH and accordingly the strains have been examined after the procedure of D. O. Norris in measuring acid or alkali production by rhizobia. A research paper on the lucerne work is in the press (N.Z. Jl. Agric. Res.) and a report on clover rhizobia is in preparation.

(b) Field plots have been established in tussock grassland soil on the Mesopotamia (Rangitata) and the Coleridge runs, to examine the performance of *Rhizobium trifolii* strains when introduced on surface-sown seed. Comparisons are being made between levels of inoculation.

(c) Experiments are continuing on the effectiveness of adding molybdenum as a seed application to *Rhizobium*-inoculated seed.

Deterioration of Lucerne, I. D. Blair, P. E. Burnett

A research contract has been arranged with the Department of Scientific and Industrial Research for a period of two growing seasons and which aims to examine the significance of disease or other factors in relation to vigour and productivity of lucerne, in Marlborough, Nelson, Canterbury, Otago and Southland.

Microbiology of Wool, A. P. Mulcock, Miss M. Vance

1. Brown Stain

(a) A brown discoloration of fleece wool has been investigated and the causal organism isolated and described. The pigment causing the colour has been purified and its chemical characteristics examined.

(b) A brown stain of pelt wool has been further studied and the dyestuff isolated and a start made on its examination.

2. Micro-organisms in Fleece Wool

The numbers and types of micro-organisms which occur in different types of fleece wool are being examined by regular sampling of the Lincoln College experimental flock.

3. Disease Conditions of the Skin and Wool, A. P. Mulcock, D. N. Brewer

A survey of the incidence and severity of disease conditions in the fleece is being made and the nature and causes of the diseases investigated.

FOREST TOPICS

1. *Studies on the Break-down of Organic Matter in Forest Soils*, with particular reference to soils of the Nelson area has begun with preliminary screening of numbers and types present. A. P. Mulcock, M. Noonan

2. *The Utilization of Sawdust for the Cultivation of Edible Fungi*, A. P. Mulcock, Miss C. Reay

The growth of the mycelium of wood-destroying fungi which produce edible fruiting bodies is being studied using the rate of respiration as an indication of growth. The effects of various amendments to the sawdust on the rate of respiration is under observation.

POULTRY RESEARCH

The Effects of Mouldy Foodstuffs on Poultry Health, A. P. Mulcock, Miss B. Peddie

Investigations have begun into the numbers and species of micro-organisms

found on poultry foods in the South Island of New Zealand and feeding trials with foods inoculated with mould have been started. Wide variations have been found between the numbers of micro-organisms on different types of mash.

Histological investigations into the changes occurring in the tissues of the affected birds are being undertaken.

PUBLICATIONS

Research Publications:

153. Mulcock, A. P. and Horn, Philippa E., 1965, "Thermophilic Bacteria from Wool". Reprinted from N.Z. Jl. Agric. Res. Vol. 8 No. 4.
154. Mulcock, A. P., 1966, "The Survival of Micro-organisms in Fleece Wool". Reprint N.Z. Jl. Agric. Res. 9: 1.
163. Blair, I. D., Tan, C. F. and Palmer, T. P., 1966, "Soya Bean Trials in Canterbury". Reprint N.Z. Jl. Agric. Res. 9: 4 pp. 894-908.

Theses:

- Hollings, P. E., M.Sc. (University of Canterbury), "Studies on the Microbiology of a Soil Chronosequence near the Franz Josef Glacier".
- Menzies, S. A., M.Agr.Sc., "An Investigation of a Fungus Disease of Fathen (*Chenopodium album*)".
- Nordmeyer, A. J., M.Agr.Sc., "A Study of Micro-organisms in Soils of the Craigieburn Range."

AGRICULTURAL ZOOLOGY

(A.) TAXONOMY

1. *Diptera*, R. A. Harrison
Work on collecting and describing *Drosophilidae* is continuing.

(B.) SURVEYS

1. *Sub-alpine Scrub Insects*, A. V. Spain
Survey of insects associated with *Olearina* is being continued.
2. *Pasture Insects*, M. McPherson, R. A. Harrison
Special attention is being paid to light-trap catches of clover case-bearer moths.
3. *Lucerne Insects*, R. P. McFarlane

A systematic survey of the insects associated with selected lucerne crops is being made in Canterbury. Field studies are also being carried out in order to determine the effect of insect pests on lucerne seed yields in the South Island.

(C.) ECOLOGY

1. *Population Dynamics on Pasture Insect Pests*, R. P. Pottinger
Population dynamics studies on grass grub, *Costelytra zealandria*, and Porina caterpillar, *Oxycanus cervinata*, are being carried out with the aim of discovering the natural regulatory mechanisms of their populations. Some aspects of the behavioural ecology of these pests and their types of distribution in the field are also being studied.
2. *Hare Carcase Decomposition*, C. C. Boswell
Studies on the role of invertebrate animals in carcase decomposition are in progress.

3. *Biology of the Aphis Brevicoryne brassicae*, G. F. McLaren

Glasshouse and field studies on the biology and population dynamics have been carried out.

4. *Ecology of Magpies*, J. C. McIlroy

Magpies from all parts of New Zealand are being examined in order to study the species composition of the magpie population and the food of these birds.

(D.) SOIL BIOLOGY

1. *Effect of Soil Animals on Available Nitrogen*, O. Yaacob

The role of earthworms and grass grubs in making available nitrogen in a mineralised form is being investigated.

(E.) TOXICOLOGY

1. *Genetics of Resistance of Spider Mites*, R. A. Harrison, J. L. Brander

The genetic mechanisms of resistance of spider mites to organo-phosphate acaricides is being compared.

2. *Alternative acaricides for control of spider mites resistant to organo-phosphates*, S. C. Lee

Some cases of mite resistance to organo-phosphate materials have been reported on orchard crops in New Zealand. This study is planned to screen alternative materials in the laboratory and then test the most promising materials in the field.

PUBLICATIONS

Research Publications:

157. Buchanan, R. S., "A Microapplicator for Topical Application of Insecticide Solutions to Small Insects". N.Z. Entomol. 3: 4.

158. Brown, J. G., "Oviposition of Egg Incubation in Three Species of Small Green Chafer (*Pyronota Bois*)". N.Z. Jl. Sci. 9: 261-80.

160. Pottinger, R. P., "Observations on the Flight Activity of Stem Weevil *Hyperodes Bonariensis* Kuschel in Canterbury, New Zealand". Proc. 19th N.Z. Weed and Pest Control Con. 186-96 (1966).

Theses:

Williams, J. D. H., Ph.D., "Forms of Soil Phosphate in some Genetically-related New Zealand Soils".

Ballantyne, G. H., M.Agr.Sc., "Genetics of Resistance in the Spider Mite *Tetranychus* species".

Buchanan, R. S., M.Agr.Sc., "Toxicological Studies on the Argentine Stem Weevil *Hyperodes Bonariensis*".

French, R. A., M.Agr.Sc., "The Biology and Ecology of *Coccinella undecimpunctata undecimpunctata* L".

Kain, W. M., M.Agr.Sc., "Studies on Toxicity and Phytotoxicity of two Soil-applied Granulated Systematic Insecticides".

Thiele, G. F., M.Hort.Sc., "Comparative studies on the Toxicity of Selected Acaricides to susceptible and resistant strains of *Tetranychus urticae* Koch (Acarina: Tetranychidae)".

ANIMAL SCIENCE

Nutritional Factors Influencing Fertility in Sheep

Over the last four years experiments have been conducted at Ashley Dene to elucidate the factors which determine the ovulation rate and barrenness in ewes as determined at mating.

Sheep Breeding

Following the demonstration that first-cross Romney ewes have much higher fertility than Romney ewes, a flock of Border-Romneys is being interbred to determine whether, when the type is fixed and the hybrid vigour removed, the resulting sheep has sufficient superiority to warrant development as a new breed. At present the F_3 generation is being compared with the Romney.

Growth of Weaned Lambs and Hoggets in the High Country

Early weaning, drenching, weaning on to legume pastures have been tried to increase the poor growth rate of high country lambs. Some of these have been successful during the autumn but are rendered of less significance by reduced winter gains. It is planned therefore to shift the emphasis of study to winter nutrition.

Synchronisation of Oestrus

Studies are being made of ram-induced synchronisation of ewe mating and lambing to develop techniques for its use in farming practice. Already there is considerable farmer interest and use in the technique.

Transplantation of Adrenal Glands

In co-operation with the Medical Research Unit in Christchurch experiments are being conducted with sheep in the transplantation of glands and in particular the adrenal glands to jugulo-carotoid loops. These are being used in ACTH assay, in a study of photo-periodic effects on the adrenal, and as a means of developing techniques for the study of isolated glands.

Dairy Beef

Pure Friesian, Hereford-Friesian, Charollais-Friesian, Jersey-Friesian from the College Friesian herd plus bought-in pure Hereford and Aberdeen Angus breeds are being reared and compared for growth rate and carcass quality.

PUBLICATIONS

Research Publication:

No. 156. Coop, I. E. and Clark, V. R., 1966, "The Influence of Liveweight on Wool Production and Reproduction in High Country Flocks". N.Z. Jl. Agric. Res. 9: 165-81.

Miscellaneous Reprint:

No. 19. Coop, I. E., "A Review of the Ewe Equivalent System". N.Z. Agr. Sci. Vol. 1, 3, November 1965.

Theses:

Chowdhary, B. R., M.Agr.Sc., "Straw Feeding Trials with Sheep".

Claro-Mimica, D., M.Agr.Sc., "Study of the Growth Rate of Lambs as affected by Ewe Nutrition in early Lactation".

Odhiambo, J. F., M.Agr.Sc., "Subclinical Mastitis in relation to solids-not-fat content of Cow's milk".

Scales, G. H., M.Agr.Sc., "A Comparison of the Lactation Performances between Romney, Corriedale and Merino ewes under high-country conditions".

BIOCHEMISTRY

STUDIES OF BACTERIAL CELL WALLS

(a) *Autolysis of Isolated Cell Walls*, A. J. Wicken

Autolysis of purified cell walls of *Bacillus stearothermophilus* B65 yields a teichoic acid-mucopeptide complex. The work which established the structure of the teichoic acid has now been published and work is now in progress to elucidate the mode of linkage between the teichoic acid and the mucopeptide.

(b) *Teichoic Acid from Bacillus coagulans*, I. T. Forrester and A. J. Wicken

The structural characterisation of this teichoic acid, which has some unusual features, has been completed and the results published.

(c) *Electron Microscopy of Cell Walls of Bacillus spp.*, A. J. Wicken

Complementary to chemical investigations of the structure of cell walls of bacilli, electron microscope examination, utilising a variety of techniques of purified cell walls, is in progress.

(d) *Cell Lipids of Thermophilic Bacilli*, A. J. Wicken

Several thermophilic bacilli examined have been shown to contain higher proportions of lipid in the cell walls than is usual from Gram-positive organisms. The nature of this lipid and its possible significance in thermophily is being examined.

(e) *Nature of Lysozyme Resistance in Thermophils*, W. D. Grant, A. J. Wicken

Several strains of *Bacillus stearothermophilus* resistant to lysozyme lysis have been developed and are being used in a study of the mechanism of lysozyme resistance.

Nature of Soil Organic Phosphorus, A. J. Wicken, K. Martin (Soil Bureau)

Some of the results of this investigation have been published.

RUMEN BIOCHEMISTRY

(a) *The Rumen Bacteria of Sheep*, B. H. Howard

The isolation of bacteria characteristic of the sheep rumen has been commenced.

(b) *"Quin's oval" Cell Wall*, A. J. Wicken, B. H. Howard

This unusual organism, unique to the rumen, has been isolated in pure, bulk suspensions. Analysis of the cell-wall of the organism suggests that, apart from its large size, it is a typical Gram-negative bacterium.

(c) *"Quin's oval" metabolism*, T. C. Reid, B. H. Howard

The suspensions of this organism vigorously ferment a number of sugars. Lactic acid is the principal fermentation product.

PUBLICATIONS

Research Publications:

155. Forrester, I. T. and Wicken, A. J., "The Chemical Composition of the Cell Walls of some Thermophilic Bacilli". J. Gen. Microbiol. (1966) 42, 147-154.

159. Wicken, A. J., "The Glycerol Teichoic Acid from the Cell Wall of *Bacillus stearothermophilus* B65". Biochem. J. (1966) 99, 108.

161. Heatherbell, D. A., Howard, B. H. and Wicken, A. J., "The Effects of Growth Retardants on the Respiration and Coupled Phosphorylation of Preparations from Etiolated pea seedlings". Phytochemistry, 1966, Vol. 5 pp. 635-642.

162. Forrester, I. T. and Wicken, A. J., "A Novel Teichoic Acid-like Polymer from the Cell Walls of *Bacillus Coagulans* NRS T2007". *Biochem. and Biophysical Research Communications* Vol. 25 No. 1, 1966.

FARM MANAGEMENT

Use of Computers for Farm Management Accounting and Planning, J. D. Stewart, N. G. Gow, N. W. Taylor (in association with B. J. Clarke, M. Wells)

In this study an attempt is being made to calculate the role that could be played by computers in farm management accounting. The original pilot scheme has now been expanded from seven Canterbury farms to eight farmers from all parts of the South Island and the Wairarapa and Hawkes Bay. At this juncture the scheme is able to produce full cash and accrual accounts on a monthly, quarterly or annual basis. Also incorporated in the computer programme is the facility to keep a record of physical quantities and to compare actual results with budgetary estimates. The final stage in the process, namely the analysis of the final accounts, is now being attempted.

The Economics of Irrigation, N. W. Taylor, J. D. Stewart

In a study to evaluate the economics of irrigation in Canterbury, a full cost-benefit study of the proposed Rakaia Irrigation Scheme is being carried out. The analysis is from the individual farmer's viewpoint initially, but will be extended to include the nation's costs and benefits. From a random sample of farms in the area, six typical farms have been selected for case study. Detailed budgets have been calculated for the development of each farm as:

- (1) A dry land unit
- (2) An irrigation unit.

From a comparison of the change in income streams generated by the two development schemes, with the income from the farm without development, the profitability or otherwise of investment in irrigation is to be evaluated.

Farm Management and Economic Aspects of Subsidies Granted for Soil Conservation Work on a High-Country Run, G. A. G. Frengley

A single high-country run is being used to investigate the national and individual effects of subsidies granted to it for soil conservation work. It is planned to retire high-country from grazing on this property and for this purpose subsidies for off-site development are granted. On-site subsidies are also granted for certain items. Four development programmes are being examined:

- (a) without subsidies
- (b) with on-site subsidies
- (c) with off-site subsidies and
- (d) with full subsidies

in order to determine their relative results. From this recommendations may be made suggesting alternative subsidy schemes.

High Stocking Rates on Light-Land Lucerne, J. D. Stewart, P. L. Nuthall, C. E. Iversen (Plant Science)

The thirty-acre farmlet at Ashley Dene is at present stocked at five ewes per acre. Indications are that this can be confidently increased in 1967.

Programming Hill-Country Development, J. D. Stewart, A. I. Bilbrough

Technical managerial and economic aspects of hill-country development are being studied in North Canterbury. This work has been greatly enhanced by

the College's purchase of a 2,300-acre property near Waikari which is to be used as a developmental project.

Management and Economic Studies of Commercial Pig Units Based on Meal Feeding, J. D. Stewart, M. G. Hollard, O. Kingma

This work which is to be financed by the National Pig Council and the Department of Agriculture is aimed at evaluating the economic viability of commercial pig units which are based on grain feeding.

PUBLICATIONS

Stewart, J. D., "Financial Factors in Rural Land Administration". In *Rural Land Administration in New Zealand*, Institute of Public Administration, Oxford University Press.

Frengley, G. A., Tonkin, R. H. B. and Johnson, R. W., "Programming Farm Development". A.E.R.U. Publication No. 35.

Nuthall, P. L., Reports to N.Z. Milk Board: "The Effect of Different Milk Payout Systems and types of Farming on the Profitability of Some Town Milk Supplying Farms in the Christchurch Area"; "The Effect of Three Reconstituted Milk Policies on Export Earnings and the Cost of Government Subsidy in the Christchurch Area".

Theses:

Crump, D. K., M.Agr.Sc., "Studies of the Economic Behaviour of Farm Families".

Donovan, W. G., M.Agr.Sc., "Economic Aspects of Urban Development with Special Reference to the Conversion of Land from Agricultural to Urban Use".

PLANT SCIENCE

Glutinosa Lucerne, C. E. Iversen, G. Meijer

Wide-scale testing of improved glutinosa lucerne has begun in a series of trials, in collaboration with the Department of Agriculture and the D.S.I.R. First results are encouraging.

Rambler X Glutinosa Lucerne, G. Meijer

A seed multiplication block has been planted, and it is hoped to start testing in 1967/8.

Ecology of Lucerne, K. M. Keogh

Studies of environmental factors affecting growth of the sward are continuing, both under controlled conditions and out of doors. Growth analysis techniques are used in this work, which includes such aspects as light transmission through the canopy and leaf longevity.

Introduction of Lucerne in Tussock Grasslands, J. G. H. White

Establishment of lucerne in acid soils is under investigation at Mesopotamia and Lake Pukaki. Seed pelleting, method of sowing, and liming form part of the treatments, whose effect is evaluated in terms of establishment, nodulation and growth.

Materials and Methods in Legume Seed Pelleting, J. G. H. White

Pot and field experiments are in progress to test the effect of various stickers, pelleting materials and methods of pelleting on nodulation and growth of lucerne and white clover in acid soils.

Cytogenetical Studies of Lucerne, A. G. Fautrier

Progress has been made with the identification of the chromosomes of *Medicago sativa*, and a provisional grouping has been made. Doubling of chromosomes by colchicine treatment has not resulted in greater vigour or fertility.

Physiological Basis of Wheat Yield, R. H. M. Langer, A. Ampong

Experiments are in progress to determine the distribution of dry matter among grain, straw and roots under a range of conditions. One investigation is designed to show to what extent moisture stress at different stages of development influences grain deposition and filling.

Soya Beans, C. T. Dougherty

Growth and yield of soya beans are being studied in relation to inoculation, irrigation and spacing. The performance of the plant is followed in detail, especially as regards flowering, pod formation and seed set.

Prairie Grass, R. H. M. Langer

Selection for increased tiller production is being attempted, in an endeavour to improve the agronomic value of this grass which has been shown to have a potential for winter growth.

Grass Introduction, J. G. H. White, R. H. M. Langer

A number of grasses have been sown in tussock vegetation at Hunua, with the object of determining which species are most suitable and whether over-sowing with clover should accompany or precede grass introduction. At Ashley Dene a further series of grasses is being evaluated under dry-land conditions.

Ecological Studies, B. P. J. Molloy

(a) Distribution and ecology of prominent weeds such as sweet brier, mata-gouri, Australian drooping sedge, and storksbill.

(b) The relationship between unimproved vegetation and site factors on selected soil sequences in the South Island.

(c) The usefulness of plants as indicators of site conditions, especially soil features, and potential land use.

Ecology of Matagouri, G. T. Daly

The ecology of matagouri is being studied at Hunua and other selected sites, especially with regard to regeneration and competition with other species.

Nitrogen Nutrition of Pinus, A. S. Edmonds

A study of pine mycorrhizas has shown a range of infectivity with varying physiological effects. The nitrogen metabolism of infected and non-infected plants is being compared. Glutamine is the main nitrogen component of transported sap.

PUBLICATIONS

Miscellaneous Reprints:

20. Langer, R. H. M., "Mineral Nutrition of Grasses and Cereals". Proc. 12th Easter School in Agricultural Science, University of Nottingham, 1965.

Langer, R. H. M., "Lucerne Development for the South Island". N.Z. Agric. Sci. 1, 32, 1966.

White, J. G. H., "Introduction of Lucerne into Acid Soils". Proc. 28th Conf. N.Z. Grassland Assn.

Theses:

- Molloy, B. P. J., Ph.D., "The Autecology of Sweet Brier (*Rosa rubiginosa* L.)".
Goold, G. J., M.Agr.Sc., "An Evaluation of Ariki Ryegrass under Canterbury Conditions".
Keoghan, J. M., M.Agr.Sc., "The Effect of Defoliation on the Regrowth and Leaf Area Index of Lucerne".
Wilson, G. J., M.Hort.Sc., "Factors Affecting the Incidence of Neck Rot (*Botrytis allii* Munn) in Pukekohe Longkeeper Onions".

SOIL SCIENCE

Ecosystem Development, T. W. Walker, A. F. R. Adams

Chronosequences and other sequences of soils and vegetation are being studied to follow gains, losses and redistribution of elements in the ecosystem during pedogenesis.

- (a) The Franz Josef Glacier Chronosequence, P. R. Stevens
- (b) The Manawatu Sand-dune Chronosequence, J. K. Syers
- (c) A *Pinus radiata* Chronosequence, I. R. Ritchie
- (d) Changes in clay and other minerals, A. S. Campbell
- (e) Changes in the nature of soil organic phosphorus, R. T. Baker
- (f) Changes in the nature of soil sulphur, A. H. Horn
- (g) Atmospheric returns of sulphur and other elements, A. H. Horn.

Mineralisation of Nitrogen and Sulphur in a Pluwosequence of Soils, K. H. Tan

The Effect of Particle Size on the Availability of Apatite, L. C. Woon

The Chemistry of Soil Sequences in Relation to Nutrient Responses, T. Witchesalls, G. McFadden

Investigation of the Causes of Poor Regrowth of Pinus radiata in the Nelson Province, B. L. Elphick, J. D. Kingston

Atmospheric Returns of Sulphur in Relation to Responses of Clovers to Sulphur in a Transect from Dunedin to the Haast Pass, Co-operation with T. E. Ludecke, Department of Agriculture.

Response of Lucerne to Fertilizers with Particular Reference to Potash, Co-operation with R. Steven, Department of Agriculture.

PUBLICATIONS

Research Publications:

152. Campbell, A. S. and Fyfe, W. S., 1965, "Analcime-albite equilibria". Amer. J. Sc. 263: 807-16, No. 65.

Theses:

- Williams, G. R., Ph.D., "A Study of Californian Quail in New Zealand, with particular reference to Population Ecology".
Lowther, W. L., M.Agr.Sc., "Studies on Legume Establishment and Growth in the Tussock Grasslands".
Ranjit Shah, M.Agr.Sc., "The Fractionation of Phosphorus in Two Soils of Different Age".

VETERINARY SCIENCE

Plant/Animal Relationships on Pure-species Pastures, J. W. McLean, G. G. Thomson, B. M. Lawson

(a) Phyto-oestrogen assays

According to the wether teat length increase assay, relatively high oestrogen activity has been observed in white clover in the spring and in lucerne in the autumn, with no activity in Arika and perennial ryegrass. Work has continued to contrast the activity assessed in this way with that assessed by the uterine weight assay in 10-12-week-old lambs, primed and unprimed with progesterone. The primed lambs showed greater sensitivity. There was good conformity between the two assay techniques. Further work is needed to establish the possible effects of phyto-oestrogens on lamb growth rate. Responses in growth rate have been shown to synthetic oestrogens down to levels of 12 microgrammes stilboestrol per day.

(b) Studies on the flavour and odour of the fat and lean meat of lambs raised on different pasture species.

In association with the Animal Chemistry Division of D.S.I.R. in Wellington, studies of the effects of different pure-species pastures on the flavour and odour of the cooked fat and meat of prime lambs, as assessed by a trained task panel, have been carried out. Differences have been observed. The effects of synthetic oestrogens on these features has also been tested. Other palatability tests with specified joints have been conducted locally with untrained personnel.

(c) Work on the effects of different pasture species on wool growth, thyroid adrenal and pancreas histology, liver and kidney size, rumen microflora and fauna species (in association with the Biochemistry Department, and rumen VFA^s is coming.

Control and Eradication of Brucella ovis infection in the College Sheep Stud Flocks, G. G. Thomson and B. Lawson, in association with D. R. Ris of the Animal Research Station, Wallaceville.

All the ram lambs, 275, were again blood-tested using the complement fixation and haemagglutination tests. Semen samples were also taken from some rams. No rams were positive to the blood tests and none was positive to the semen test. Several rams however were found to have testicles infected with *Actinobacillus seminis*.

Investigations into Neonatal Mortalities in Piglets in Canterbury, G. G. Thomson, B. Lawson

Several large-scale pig breeding establishments have experienced quite high mortality rates in young piglets as well as very poor growth rates. Investigations are proceeding into the mineral and vitamin deficiencies which appear to be involved in these troubles. Definite responses have so far been limited to selenium, copper and iron.

Bovine Mastitis Control, C. S. M. Hopkirk, C. A. Robertson

An experimental herd has been established at the College and control is being attempted by the use of methods available to the commercial farmer, namely: (a) Jetting water through the cups between cows to remove any organisms and milk left in the clusters. (b) The use of antiseptic cream after every milking. (c) Strict avoidance of over-milking.

Staphylococcus species still remain the most troublesome organisms.

Tests are being carried out twice a week in all quarters to note the presence or otherwise of leucocytes and infecting organisms. Solids-not-fat tests are also

carried out on individual quarters twice monthly to note changes due to inflammatory reaction in quarters. The effect on milk yield and fat test is also being followed. Results will be available when the lactation periods have been completed.

Bovine Brucellosis Control, C. S. M. Hopkirk, C. A. Robertson

The Christchurch milk supply herds, some 250, are being regularly tested for this disease. Except for the occasional infection due to the introduction of infected cows, the supply area remains virtually free.

PUBLICATIONS

McLean, J. W., Thomson, G. G., Jagusch, K. T., Lawson, B. M., "Lamb Growth and Development in Relation of Pasture Species". Proceedings of Ruakura Farmers' Conference Week, 1965.

McLean, J. W., Thomson, G. G., Lawson, B. M., "The Quality of Lucerne Pasture for Lamb Production". Proceedings of the Lincoln College Farmers' Conference, 1965.

WOOL SCIENCE

Application of Progeny Test and Half-Classing Methods in Merino Ram Selection, A. E. Henderson

The purpose of this work is to test the application of sheep selection methods suggested by Australian research workers. Each year wool production of year-old Merino rams is measured and the sheep ranked according to score. The top 20% are retained for a further year and production again measured. Year and two-year-old wool scores are positively correlated. Final stud selections are made at two years.

Documentation of Wool Production within a Self-Maintaining Corriedale Flock, A. E. Henderson, J. C. Simpson

A study in progress to determine the characteristics of lifetime wool production of Corriedale breeding ewes.

Comparative Efficiency of Wool Production of Romney, Corriedale and Merino Ewes, A. E. Henderson, I. E. Coop, A. South

The overall objective is to measure the efficiency of conversion of feed to wool. The experiment is designed to show the ways in which wool-growing efficiency of individual sheep or breeds is expressed.

Fleece Development of Border Leicester Sheep, A. E. Henderson

This study is designed to give information on the timing of important stages in fleece development.

Production and Analysis of Yellow Wool, A. E. Henderson

A special flock of sheep noted for production of discoloured wool has been established. This flock is to serve as a source of experimental material for a number of College Departments and the Wool Research Organisation. Studies are being made of fleece architecture, microbiology and chemistry associated with discoloration.

PUBLICATIONS

Theses:

Naqui, M. A., M.Agr.Sc., "A Study of Medullation of Wool Fibres".

South, A. C., M.Agr.Sc., "The Efficiency of Wool Growth in Merino, Corriedale and Romney Sheep".

White, D. H., M.Agr.Sc., "A Study of the Importance of Cell Size in Quantitative Wool Production".

