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*The year 1966 is Technical Education Year in Western Australia. To facilitate discussion about agricultural education, this issue of Farm Policy is devoted to technical and farmer education. The articles are concerned with agricultural education at other than university level.*

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# farm policy

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## JOHN THOMSON AGRICULTURAL ECONOMICS CENTRE

Farm Policy is a quarterly bulletin on economic policies affecting Australian agriculture, compiled by the John Thomson Agricultural Economics Centre at the University of Western Australia's Institute of Agriculture. This Centre was established in 1961 as a problem-solving research unit in agriculture and economics. From time to time the Centre's research findings are reported in this bulletin.

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## SUBSCRIPTION

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## Martin Report — Agricultural Education

*In 1961, the Prime Minister appointed a committee under Emeritus Professor Sir Lesley Martin to make recommendations to the Australian Universities Commission on the future developments of tertiary education. The following article consists of extracts on agriculture from the Report of the Martin Committee.\* It does not include any of the recommendations concerning veterinary science or forestry. These extracts are reproduced by permission of the Minister-in-Charge, Commonwealth Activities in Education and Research, Senator the Hon. J. G. Gorton.*

THE general problem of educating people for work on the land is similar to that which exists in other callings. The past quarter-century has seen a great revolution in farming. The tractor has replaced the horse, and most farm operations are now mechanised. In addition, the amount of technical and scientific knowledge underlying most farm processes has increased greatly, few countries showing bigger advances in this direction than Australia. In our knowledge of soil deficiencies, of the basic facts behind many of the maladies of our livestock, of the scientific methods available for the control of diseases, pests and weeds, we are well to the fore. But this new knowledge is as yet applied only on a somewhat limited proportion of farms; and behind this state of affairs lie economic and sociological problems which require constant investigation.

If our farming industries are to improve and maintain their standard of efficiency, the education of all farm workers must keep pace with the advance of knowledge; and it is important that the structure of the educational system through which they pass should be of a type which is sufficiently flexible to permit those with a capacity for higher education to obtain it. Moreover, the recent advances in technical and scientific knowledge applicable to farming probably represent only a stage in a progressive series. The future is likely to show results which will be just as impressive as those of the last quarter-century. It is important that discoveries should be conveyed to the farming industries as soon as practicable after they are made, and this will require a cadre of extension officers with an educational background which has fitted them to appreciate such discoveries. The administrators of the agricultural organisation and its various parts also need training in the problems of farming in order to be efficient in the handling, manufacture and sale of its products.

Farmers who are operating properties with a large capacity for production would certainly benefit by tertiary education if they have the oppor-

\* Tertiary Education in Australia : Report of the Committee on the Future of Tertiary Education in Australia to the Australian Universities Commission. Vol. II, Aug. 1964.

tunity and the talent to absorb and utilise it. Such an education would help them not only to manage their farms but also to understand and appreciate the problems which confront their industries both in Australia and overseas. With this knowledge they could form a rural intelligentsia which would be invaluable in deciding rural policy and from which leaders of the agricultural industries would eventually emerge. Without such leadership the rest of the rural community is likely to be exploited by charlatans or over-impressed by thrusting salesmen in this age of organised propaganda which becomes increasingly powerful as the years pass.

However, although only a small proportion of the half million farmers and others working on farms will need, or seek, tertiary education, many of them will benefit from and welcome short refresher courses of a specialised type at various stages in their farming careers. The organisation of such courses has begun only in recent years. If it is to prove effective, adequately trained instructors with a tertiary education will be required.

The remainder of the groups mentioned above, including technical consultants and research workers, all need some tertiary education. Otherwise they are apt to be little better than the blind leading the blind—and ditches are common in the field of farming!

In Australia, the institutions which provide education at tertiary level for those who are concerned with farming and its products fall into two main categories—agricultural colleges and faculties of agriculture in the universities.

#### AGRICULTURAL COLLEGES

Most of these were founded towards the end of the 19th century on the lines of the land grant colleges in the U.S.A. But whereas, in America, many of the state agricultural colleges developed into universities, no corresponding transformation has occurred in Australia. Australian colleges have remained as training institutions for farmers and for those seeking subordinate posts in connection with farming, although some have been centres for a little plant breeding and field experimentation. At present the majority of the colleges are under the control of departments of agriculture in their respective states. Upkeep is relatively costly to the state because the fees charged are low. The Burnley College of Horticulture in Victoria, founded recently, has replaced an earlier organisation of somewhat lower standard. The enrolments of diploma students at the various colleges in 1962 totalled 1,118.

Each college has a large farm attached to it so that its students can obtain some insight into the problems of field work and gain practical experience in farm management. Most of the colleges have a dairy herd and the necessary buildings and pastures, while some have established small dairy factories. Where practicable, small areas of land are irrigated in order to demonstrate the irrigation principles in the district concerned. Piggeries, poultry units and small or large market garden and horticultural areas have been developed at most of the colleges. The buildings vary according to the age of the institution. Some have been rebuilt in recent years. The laboratories are moderately well equipped, but generally not above the level of that expected at a good secondary school. Practical work-shops are provided for craft training, mechanical instruction and repair work.

The students come to the colleges from various sources. Some are the sons of farmers, but a considerable proportion are city-bred lads who enrol at agricultural colleges because they do not intend to take university courses and because they prefer an open-air life to a sedentary occupation. Some are probably sent by their parents because the colleges offer a period of secondary and tertiary education during which the boy may find his metier—and the cost of the course is low. The entrance qualification in the past has been the Intermediate Certificate (usually two years below matriculation in standard), but many students have sat for examinations at matriculation level.

The diploma courses are usually of three years, but students who have reached matriculation level are usually given a concession of one year, provided they have had farming experience before they enter.

The curricula vary but, in general, certain basic subjects are taught. For example, those enrolled for a three-year course study English and elementary mathematics. Elementary science—chemistry, physics and botany—of an applied character, as well as book-keeping and elementary economics, are also included in the general course. The more technical training is in agriculture (including farm management), animal husbandry (breeding, nutrition, etc.), dairying and principles of horticulture. In addition, blacksmithing, carpentry and, in some colleges, saddlery and leather work are included among the crafts taught.

The general principle is that each student should spend at least one third of his time doing practical work on the farm. The wide array of equipment is intended to provide for this; but the task of allocating **effective** technical tasks to, say, 60 energetic students each day is not simple. As a result, criticisms are frequent that the tasks set are not man-sized jobs, and that this inculcates ideas of a prodigal use of labour which Australian farming cannot afford. It is easy to criticise the colleges in this regard, but not so easy to make constructive suggestions as long as the principle of 33 per cent field work remains.

This raises a fundamental issue summed up in the question of how far the state can be expected to provide effective practical training in farm operations now that mechanisation has so greatly increased the size of the economic farming unit. This leads to a second question: should the colleges train students for higher levels of knowledge in the tertiary field, confining instruction in the routines and techniques of farm operations to demonstrations, and leaving all manual practical experience to be acquired on commercial farms elsewhere?

Educationally, it appears that the work of the colleges has been restricted by the practice of admitting students whose general educational level is lower than that of entrants to a university. In the past this has been due to the lack, in many farming districts, of opportunities for secondary education. As this deficiency is now disappearing, there seems little reason for accepting as diploma students at these colleges any person whose education has not reached a level comparable with that required for entry to a university, although the range of subjects in the examination concerned need not be the same as that required for admission to a university.

Such a change would raise the standard of the diploma courses by enabling the colleges to base them on a more scientific footing. It would therefore increase the rather limited number of trained people in the community with a sound scientific outlook towards modern farm problems,

and it would improve the capacity of the diplomates for occupation in many types of work. It would also make it easier for them to appreciate recent advances in scientific agriculture as well as those which are likely to occur in the future.

This does not mean that the owners of farms and others who want a technician's course in practical farming on a modern basis should not be catered for at the colleges. Short courses of a year, or preferably less, could be devised for this purpose. These courses would be limited in scope, and, if those who attended them had already acquired a knowledge of the way in which farm work is done, the colleges would be relieved of the necessity for giving this part of the training.

At various times most of the colleges have had experience in organising short courses for farmers, and some of them provide special courses in technological subjects, e.g., dairy technology and food technology at Hawkesbury, and oenology at Roseworthy.

If the proposed change in the structure of the diploma courses at the colleges is to take place effectively, there must be some augmentation of personnel, more discrimination in the selection of the teaching members and their staffs and, probably, some improvement in the equipment and teaching aids provided for the training of students.

A special problem concerns the staffs of the colleges. At some agricultural colleges they work under the disadvantage of being teachers who are not part of a large teaching organisation, so that opportunities for advancement are relatively infrequent. From this point of view, and also for the maintenance of a progressive attitude towards advances in knowledge, it would be advantageous if teachers giving instruction at the tertiary level could be affiliated in some manner with the general stream of teachers concerned with higher technical education.

It is important that members of the college staffs should have some opportunity to carry on field investigations as often as is feasible in association with senior students. Fortunately, in agriculture, the variety of relatively simple investigations, which can be profitably made, is large. This suggestion is important because only in this way will the lecturers at these colleges maintain a progressive attitude towards new ideas in the sphere of agriculture.

If the proposals of this Committee for an Institute of Colleges in each state are accepted, the agricultural colleges might well become constituent members. Such membership would provide the opportunity for several changes insofar as their diploma courses are concerned:

- (a) Standards of entry would be laid down. Students with less than matriculation qualification might well spend a year at a recognised technical college where they would also have instruction in the basic sciences. They would then transfer to the agricultural college.
- (b) The emphasis on the instruction at the college would be moved, and would then rest on the scientific approach to farming methods with adequate basic science to facilitate the understanding of the modern study of plants, animals and soils.
- (c) Practical work would be reduced to the demonstration of farm procedures by competent instructors. To this would be added a period of practical experience on a commercial farm for those students who had not had such experience previously.

- (d) A study of the costs of farming operations and of handling produce, together with an appreciation of the economic situation of each farm industry in Australia and a broad assessment of overseas markets for commodities, would be included in the course.

The Institute of Colleges would, by its control of standards, ensure that the level of the teaching was sufficient to train students for technological positions of a character for which the present diploma standards are too low. Enquiries suggest that there is a considerable demand for such diplomas, and that at least some of the university courses are not meeting this demand because their graduates are over-specialised.

#### FACULTIES OF AGRICULTURE IN THE UNIVERSITIES

These originated in the early part of the present century soon after the probability of world starvation in the 30's had been forecast by Sir William Crookes (in 1898), and at a time when the application of science to the problems of farming was being widely advocated. The need for courses in scientific agriculture is based on the fact that the special directions in which pure scientific knowledge can be of value to the practices of cropping and livestock management are often not of interest to those who are trained in, and are following, the pattern of pure science. An extensive literature has been built up on the application of science to rural industries, and today all Australian universities (except the Australian National University and Monash University) have a faculty or faculties dealing with agricultural subjects.

If the diploma courses at the agricultural colleges were raised to the level required by an efficient technologist, some of the load on university faculties of agriculture would be lifted. The less well equipped students, who at present find university courses too scientific, could become effective candidates for diplomas.

If the instruction given in agricultural faculties is to be successful in raising the general level of farming, it is important that their students should acquire sufficient knowledge of the practical aspects of this industry to enable them to see the points at which scientific discovery can be effectively applied. This means that the students must live on a farm, or farms, during part of their course. The deans of faculties uniformly insist on the desirability of each university having a farm for the practical training of its agricultural students and for field studies.

Students must also have sufficient training in economic principles to help them to understand the costs of changes in farming methods, as well as the benefits which such changes should bring. At some stage, they should learn to appreciate the fact that farming is a way of life as well as an economic process, and that farmers in a free community are not merely units in the national production machine but human beings with the hopes and fears peculiar to those whose livelihood depends, to a certain extent, on conditions which they cannot control. Conflicting hopes and fears breed uncertainty, an attitude of mind which requires consideration.

Considerable differences exist among agricultural faculties of the Australian universities in respect to their outlook. Some are mainly concerned with the developments of science in its various branches as they affect



farming; others have endeavoured to maintain a balanced course in which the application of science to agriculture and all its implications are considered together with the problems of the farmer. The former group is interested in training specialists and research workers, and their graduates will have much to learn before they can be of direct practical value to the farmer on his farm. The latter group endeavours to train graduates who, while having a sound scientific basis in their training, are mainly interested in promoting efficiency on farms. In addition, others of their graduates with a greater capacity for advanced scientific work will, after more advanced training, become research workers in the field of agriculture.

From Australia's point of view the relative advantages of the two types of course seem to depend on the national needs for the two types of graduate. Evidence suggests that the chief shortage of trained men lies in the group responsible for translating the results of basic research into terms of farm procedures by the organisation of field trials, the use of methods of mass communication, and by making the farm-to-farm visits which are part of an efficient extension service. The need for research workers and for men trained as specialists in such subjects as entomology, plant pathology, and animal nutrition, is also considerable; but the numbers concerned are smaller than those needed to translate the findings of research into practical agriculture.

#### AGRICULTURAL ECONOMICS

This branch of agricultural science has come to the fore since more people have begun to realise the implications of the oft-quoted dictum—"Modern farming is a business and not merely a way of life." The subject has many sides—the study of markets and of methods of marketing, the survey of actual industries in rural districts, the analysis of efficiency in farm management, the study of land tenure systems, the estimation of the economic merits of introducing new methods or of changing from one type of production to another, and the development of a critical approach to the use of official statistics and of data collected from surveys. In recent years the assessment of farmers' responses to the pressure of new ideas has also become a matter of widespread interest. Although, in this world of competitive international production, this appeal is understandable, there are dangers that wrong conclusions may be drawn unless extraneous factors such as political forces at state, federal and international levels, quite apart from the more mundane forces of weather, diseases and pests, and local pressure groups, are taken fully into account when the study is undertaken.

It is one thing to teach economic principles and their application to farming, but another and more difficult one to evaluate the extraneous forces which are often equally important. Farm management is also a difficult subject, and it is open to doubt whether it can be effectively taught to students who have not had personal experience in the management of a commercial farm. In other words, it is a subject for post-graduate courses.

#### COURSES OF A MORE TECHNICAL CHARACTER

Agricultural engineering at tertiary level is a specialised activity of

increasing importance. Every farmer should have some knowledge of elementary engineering principles so that he may be able to deal with the everyday problems of farm equipment and the maintenance of his machinery. More detailed and more advanced technical knowledge is required by those who are to design machines for farming or to adapt overseas types for use under Australian conditions. The basic training here is in engineering, but a graduate, or a diplomate of a technical institute, who intends to work in these fields will have a much greater chance of success if he has some agricultural knowledge as well. He will then fall into fewer errors when dealing with problems in which the physical intricacies of soil types are concerned, or with others where plant material is being processed. The University of Melbourne offers a course (B.Agr.Eng.) which covers a range of subjects most of which deal with civil or mechanical engineering. However, it also contains some instruction in agricultural matters. This course is under the Faculty of Engineering, but the agricultural section is dealt with in the Faculty of Agriculture. The University of New South Wales also provides a course of technical character for agricultural engineers.

The great importance of wool in the Australian economy has encouraged the formation of technical courses at many centres. Most of these do not come within the ambit of tertiary education, but in the University of New South Wales and at the Gordon Institute of Technology at Geelong, courses at a more advanced level have been developed.

At the University of New South Wales the School of Textile Technology offers four-year courses in textile chemistry, textile physics, textile engineering and textile manufacture. This University also has a School of Wool Technology which provides a five-year course specifically aimed at training men for posts in the wool industry, either on wool producing farms or elsewhere as assistants to wool growers, and in the extensive system of handling wool. This course has a scientific basis in the first year, after which it includes subjects dealing with the practical aspects of the sheep industries and scientific subjects connected with the breeding, feeding and maintenance of flocks.

The Gordon Institute has been providing textile training since 1946, and a large new textile college was opened in 1951. The courses at tertiary level in textiles require the Leaving Certificate (matriculation, minus one year) for enrolment. Those for the Diploma of Textile Industries and the Diploma of Textile Chemistry occupy four years; both contain considerable amounts of basic science, but are in the main technical. The first year provides a general training and can be taken at other technical schools. In 1962, there were 51 students in the three later years of these diploma courses. The Post-graduate (Fellowship) Diploma requires a technical diploma at entrance and occupies four terms. Two students were taking this course in 1963. These courses would, in future, come under the general supervision of the proposed Victoria Institute of Colleges.

Since modern agriculture depends so greatly on the use of machinery, it is important that mechanics with sufficient skills to maintain and repair various types of machinery should be available at each rural centre. Modern farmers also need far more technical training than did their predecessors in the various crafts associated with their calling. The agricultural colleges already provide some of this and could provide more,

but further special courses for farmers at rural technical schools would be advantageous. Such courses are scarcely within the bounds of tertiary education, but the instructors who provide them need training at that level, and there is room for many more of them.

## Agricultural Education in Australia and Other Countries



*Advances in science and technology have generally been paralleled by changes in the curricula and courses of secondary and technical schools. It has yet to be shown that advances in farming technology, and in management technique, have been paralleled by similar improvements in Australian agricultural education.*

THERE have been few reports concerning Australian agricultural education, and these have not included discussion of the training of persons entering farming. The most recent bulletin on agricultural education from the Commonwealth Office of Education states: "Agriculture and related subjects, as might be expected, have an important place in Australian education curricula." However, the bulletin does **not** discuss the adequacy of the standard and sufficiency of such training, nor is a distinction made between the training opportunities for persons intending to enter farming, and persons intending to enter other agricultural vocations.

The report of the Martin Committee on tertiary education states: "Australian colleges have remained as training institutions for farmers and for those seeking subordinate posts in connection with farming." The report shows that 1,118 Diploma students were enrolled in Australian agricultural colleges in 1962, but there is no discussion of the number of these students who enter farming, of the drop out rate, or of the effect of three-year courses on student output. Figures for 1960 to 1962 inclusive, showed that only 45 per cent of Australian diplomates returned to farming or pastoral occupations. Thus, on the average, less than 150 college-trained students entered Australian farming in each of the three years. Furthermore, the Committee recommended that college entrance standards should be raised considerably. If standards were raised, it is probable

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that the college courses would be used even less for the training of future farmers.

A basic educational principle is that training should be related to needs. A major need of farmers is for efficiency in farm management. The purpose of this article is to evaluate what training is currently available for intending farmers in Australia.

In the comparisons which follow, the facilities, standards and results of agricultural training in Australia are compared with those in other countries. The countries compared are the United Kingdom, the United States, Sweden and Denmark. In the comparisons, training at the university level is disregarded as is primary school 'rural orientation' and Intermediate standard Agriculture. The reasons are that few university graduates enter farming, and it is unlikely that training at less than an upper secondary level will affect eventual farm management ability. The comparisons deal with agricultural subjects in normal secondary curricula, specialist secondary courses in agriculture, technical and college courses in agriculture, and the educational opportunities existing in Junior Farmer organisations.

### SECONDARY LEVEL AGRICULTURAL EDUCATION

In Australia most secondary Agriculture is taught as a single subject at Junior or Leaving level. However, the vocational value of such subjects is doubtful, since few schools possess practical training facilities, there is a scarcity of trained teachers, and the courses occupy one-sixth or less, of the student's time. Of the five countries compared, only Australia and the United States, include Agriculture in the school curriculum. In the United States, however, **vocational** courses include practical training and occupy almost one-third of student time.

In Europe, courses at a low-middle secondary level are provided for **farm workers** by means of evening classes, short courses or day-release classes associated with apprenticeship schemes. In Australia specialist agriculture education for future **farmers** is given in residential secondary schools, but this at a low-middle secondary level. Ages of students doing these courses range only from 14-16 years. Such students have insufficient practical experience to appreciate management subjects, insufficient opportunity to complete a sound general education, and they return home too young to influence their parents' managerial decisions. American students at this level attend the first two years of a four-year course.

Agriculture is taught as a Leaving subject in all Australian States but is not always taken to matriculation level and is often treated as an alternative science unit rather than as vocational training. This is because facilities for practical, managerial, and economic training are usually inadequate.

In Europe, most residential agricultural schools cater for students at a high secondary level. Denmark has 29 such schools, Sweden 55, and the United Kingdom 40. In the 10,000 high schools of the United States, most of the agricultural courses proceed from first to the fourth and final year. Upper secondary specialist training in Australia appears to be provided by the final two years of only five five-year high schools.

Entrants to the purely vocational European agricultural schools have already completed their general education, and in fact, have been away from school for one or more years. Nevertheless, European countries seem to have little difficulty in recruiting agricultural students, in spite of the

fact that their entrance requirements appear more exacting than those of Australia. The recruitment of large numbers of older students to residential schools allows teaching to proceed at a higher level and within an agricultural environment. In addition, a demand for out-of-school experience ensures that students can better appreciate subjects such as economics and accounting, farm management and marketing. These subjects are seldom meaningful to younger student groups.

One advantage to be gained by increasing the standard of secondary agricultural education in Australia, is the elimination of the basis for the idea that such education is appropriate only for less able students. This idea is likely to persist, with some justification, as long as most vocational training courses begin early in the student's secondary schooling. Until Australia's specialist agricultural courses are placed on a level equivalent to that of the secondary professional courses, it will be difficult to persuade better students to choose them. The advantage of having older students in residential agricultural schools is evident in Denmark and Sweden. It is claimed in these countries that the opportunities for discussion and seminar work enable students to develop an interest in learning which persists throughout their farming career. In the United States similar opportunities result from membership of the Future Farmer Clubs.

#### NON-UNIVERSITY, TERTIARY LEVEL AGRICULTURAL EDUCATION

High level vocational training is carried out in residential institutions in all countries included in this comparison. The content of the courses seems comparable, though there are variations in length of courses, in the proportion of practical work, in the emphasis on economic and management subjects, and in entrance requirements. Apart from the two-year course at Muresk in Western Australia, Australian agricultural college courses extend over a three-year period. This compares with two-year courses in the United States, England and Wales, and with one-year courses in Scotland, Northern Ireland, Denmark and Sweden. The shorter courses in these countries allow a greater student output from each school, and apparently result from the smaller amount of time spent on practical training. This is possible because practical experience is a pre-requisite of college entrance in these countries. Academically, the entrance standard of Australian colleges is higher than that of Denmark or Sweden, but lower than that of colleges in the United Kingdom or the United States.

Therefore, although there are a comparatively large number of agricultural colleges in Australia, these are not making as great a contribution to the training of persons entering farming as could be expected. Rather, as suggested by the figures quoted previously in this article, they tend to be used for the training of technologists servicing agriculture. **This means that most specialist agricultural training in Australia is available only at a low secondary level, and consequently cannot train for the increasing technical, managerial and economic needs of modern farming.**

#### OTHER AGRICULTURAL TRAINING

All countries in this comparison have developed various other types of agricultural training. All have a Junior Farmer Organisation or its equivalent, which gives members further educational opportunities of a social, general, or vocational nature. All provide a variety of technical

and correspondence courses in agriculture, though in other countries these courses are not considered as part of formal agricultural training, unless associated with apprenticeship schemes. In Australia however, correspondence courses often represent the only form of training available to farmers who have left school, apart from very short courses occasionally provided by State Departments of Agriculture.

In Denmark, additional training is provided in folk high schools by small-holder associations and agricultural societies. About 8,000 people annually attend classes for courses that extend over four years. Previous attendance at such classes is frequently a requirement for admission to the agricultural schools.

Swedish 4-H is an important educational force that has trade, rural and educational instructors who are nationally organised. In addition, the Swedish Farmers' Federation annually organises correspondence classes for about 40,000 people, and arranges evening classes for off-season farm workers. The Federation also offers five-month co-operative management courses at its own farm school. Classes conducted annually by local agricultural societies reach a further 175,000 people, using vocational and general educational material initiated at the Federal level.

In the United Kingdom, part-time technical courses associated with the apprenticeship schemes, are conducted in local farm institutes and agricultural colleges. In the United States, young and adult farmer programmes are organised in addition to the training supplied by Future Farmer, New Farmer, and 4-H organisations. Young farmer programmes continue the agricultural training of those who have recently left school. Adult programmes enable farmers to keep abreast of developments and innovations in agriculture.

To satisfy the demand for trained farm workers, apprenticeship schemes are common in the European countries in this comparison. Such schemes are also being introduced by many other countries, including Austria, France, Germany, the Netherlands and Switzerland. Such schemes are organised by government or private institutions. They supervise both the farmer and his apprentice, and guarantee a bonus wage for the apprentice on completion of his time. These countries thus appear to place greater emphasis than Australia on vocational training for their farm workers.

Although agricultural subjects at Intermediate and Leaving levels are available to both boys and girls in most Australian high schools, there are few residential facilities catering for the agricultural training of girls. In Denmark and Sweden girls may attend the part-time winter courses and folk high school courses, though not the residential courses. Throughout the United Kingdom most residential institutes and colleges cater equally for boys and girls. Similarly, courses in American high schools and junior colleges are open to both sexes.

#### THE TEACHERS OF VOCATIONAL AGRICULTURE

In the United States, all teachers of vocational agriculture are graduates of four-year courses given by Land Grant Colleges. Additional training for these graduates is given by university 'teacher trainers' of whom about 280 were supplying professional courses in agricultural education in 1960. In Denmark, regulations governing the receipt of State subsidies ensure that all staff must be graduates from the Royal Veterinary and Agriculture College. Schools in Sweden also employ graduates only.

In the United Kingdom, about 45 per cent of all agricultural teachers are agricultural graduates, while a high proportion of the remainder are diplomates. Although the Table below is not completely definitive, it appears certain that Australia employs a smaller proportion of qualified agricultural teachers than the other countries under discussion. Table 1 summarises the Australian situation at the end of 1962.

Table 1  
QUALIFICATIONS OF AUSTRALIAN TEACHERS OF AGRICULTURE - 1962

State	Teachers at College Level	Agricultural Graduates	Agricultural Diplomates	Teachers at Secondary Level	Agricultural Graduates	Agricultural Diplomates	Total Teachers of Agriculture
N.S.W.	52	27	21	105	36	1	157
Q'ld	39	12	22	15	—	15	54
S.A.	20	10	n.a.	34	11	18	54+
Tas	No Agricultural College			10	—	10	10
Vic	50	15	17	n.a.	n.a.	n.a.	50+
W.A.	13	3	3	10	2	2	23
Total Aust.	174	67	63+	174+	49+	46+	348+
Percentage of Graduates							33.3
Percentage of Diplomates							31.3

The fact that many Swedish agricultural teachers also serve as agricultural advisers accounts for about 21 per cent of agricultural graduates being employed as teachers. This figure compares with 7 per cent in Denmark, 15 per cent in the United Kingdom, 29 per cent in the United States but less than 5 per cent in Australia.

#### THE RESULTS OF AGRICULTURAL TRAINING

To evaluate a training programme, both the output of training, and the performance of those trained, need to be considered. There has been little attempt in Australia to examine the effect of training on performance, but it is possible here to compare training output with the output of agricultural education in other countries. Table 2 shows the figures for Australian output, which for comparative purposes, includes all college diplomates, all secondary level students completing specialist agricultural courses, and all those students who take Agriculture as a Leaving subject within their normal school curriculum.

Table 2\*  
AVERAGE ANNUAL OUTPUT OF AUSTRALIAN AGRICULTURAL EDUCATION, 1960-62

State	College Diplomates	Agricultural High Schools	Other Passes at Leaving Level	Total
N.S.W.	105	170	242	517
Queensland	70	—	—	70
S.A.	28	n.a.	132**	160
Tasmania	—	42	90	132
Victoria	99	—	165	264
W.A.	24	110	20	154
Total	326	322	649	1,297

\* For reasons outlined earlier Table 2 does not include students completing Intermediate or Junior level Agriculture.

\*\* Includes output of South Australia's Agricultural High Schools.



In Table 3 the Australian figures are compared with other countries. Output for these countries includes those students who have taken specialist courses only, and does not include the results of apprenticeship or young farmer courses, enrolments in folk schools, in technical schools, or in correspondence courses. To make meaningful comparisons, student output is related to the size of the agricultural work force.

Table 3  
**THE RELATIONSHIP BETWEEN THE OUTPUT OF AGRICULTURAL EDUCATION  
 AND THE TOTAL FARM LABOUR POPULATION**

Country	Student Output (a)	Farm Labour Population (b)	Percentage: (a) of (b)
Australia	1,297	393,000	0.33
Denmark	2,500	363,000	0.69
Sweden	3,163	632,000	0.50
United Kingdom	3,689	900,000	0.41
United States	102,136	7,118,000	1.43

In spite of arguments against the validity of this comparison, it demonstrates that Australian student output compares unfavourably with that of the other countries. Furthermore, more than half the Australian agricultural college output does not enter farming, and large numbers of Leaving agricultural students do not go on to farms. This may apply to agricultural students in the other countries, but in these countries training other than that provided by **specialised** courses, has been omitted from the comparisons in Table 3.

Overseas studies often relate output to the annual number of retiring farmers. Assuming 30 years as the average farmer's working life, it is calculated that the annual output of formally trained future farmers in Australia is about 15 per cent of the annual retirements. This compares with 21 per cent in the United Kingdom, 39 per cent in Sweden, 45 per cent in Denmark and 83 per cent in the United States. Whatever the arguments against the use of this simple measure, it again demonstrates that Australia's output of trained persons entering farming is well below that of the other selected countries.

### CONCLUSIONS

In spite of the need for increasing managerial skills, there are fewer opportunities to obtain sound vocational farmer training in Australia than in the other countries. This situation may be the result of a smaller demand for such training, but this lack of demand should not be interpreted as an adequacy of future farmer training by those responsible for the supply of such training.

In Australia there appear to be several reasons for a lack of demand for the training of persons entering farming. One is the isolation and small labour unit structure of farms. It is not an attractive prospect for a farmer whose son constitutes a third, or even a half of the work force, to board that son away from home for further education. Many sons are therefore withdrawn from both agricultural and general education at or near the school leaving age, and before their technical and general education is complete. However, a comparison of farm labour statistics indicates that it is Sweden, not Australia, which employs the smallest labour force per farm. Nevertheless, Sweden appears to have little difficulty in providing

a high grade training programme for a large proportion of those persons entering agriculture.

A second factor influencing demand is that many agricultural courses are regarded as non-academic alternatives and are therefore taken by less able pupils. Able students are directed to more challenging courses. The supply of students is further handicapped by the practice of wealthier farmers of sending their sons to residential schools which do not give emphasis to agricultural education. It is possible too, that the lack of trained agricultural teachers is reducing the number, and training standards, of agricultural facilities in Australia. Whatever the reasons, the supply and standard of most agricultural training is below that of the other countries referred to in this article. There are signs of a growing demand for agricultural education in Australia. However, until training standards are improved, farmers are unlikely to lose their inherent suspicion of agricultural courses. Administrators of agricultural education thus face the problems of raising standards, but at the same time of increasing enrolments in their courses. Not until such problems are faced, and overcome, is Australia's agricultural training likely to exert its potential influence on Australian farming.

A. W. Humphries

## A Simple Step Towards Better Agricultural Education?



*As one already convinced that agricultural education in Australia could be a lot better, I present here a brief case for one simple important step towards its improvement.*

THE present system in some respects lags well behind the needs of agriculture. Some of this is doubtless due to democratic inertia, but in addition, a failure to clearly define needs keeps some of our teaching institutions out of date. To clarify often means to simplify, and in the present case, the educational requirements for agriculture can be simplified into three main categories.

For research, for higher levels of teaching, and for extension work, advanced tertiary education is essential. The requirements are exacting, because knowledge of several branches of fundamental and applied science must be combined with some grasp of practical agriculture. It is this level of knowledge and activity which is conveniently and most accurately called Agricultural Science.

Agricultural Technology is less easy to define, because more diffuse. It includes specialised mechanical and other services to farmers, technical assistance to scientists, and perhaps some other occupations on the fringes of agriculture, like valuing and surveying. For our present purpose, it should be noted that the requirement in this broad field is for specialised skills, which although often linked with science, do not require any deep understanding of scientific principles.

The latter point applies even more to the third category—those engaged in practical farming. Nevertheless, it must be conceded that the farmer

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also has an important area of contact with science, which is likely to grow larger in the future. In this case, the scientific and technical specialists need to be able to communicate with the farmer. To make the best use of their services (and to discriminate between good and bad advice) the farmer must have some knowledge of the specialist services which are available, and some understanding of the specialists' jargon. As well as this, he must be competent in stock and crop husbandry, mechanics, and so on.

In the light of these three broad kinds of educational needs, it can be shown that the present Junior and Leaving "Agricultural Science" courses in Western Australia satisfy none of them. The syllabuses for the two levels are very similar. They include study of the physical and chemical properties of matter, especially air and water; mechanics; heat; magnetism; elementary astronomy; geology; climatology; soil science (several aspects); plant and animal anatomy; plant and animal physiology; reproduction; pathology; nutrition. The list is incomplete, but it is long enough to show that the only major difference in scope between this and the university degree course is the inclusion of economics and farm management in the latter. The difficulties of achieving reasonable standards of teaching over such a wide range of subjects hardly requires comment. The undergraduate student has four years of full-time study available to him, and normally undertakes it with a backing of Leaving physics, chemistry, mathematics and perhaps biology. Yet there are serious problems involved in reaching adequate standards for the degree, and an increasing proportion of graduates go on to further study in the specialty of their choice. The conclusion is inescapable that the teaching of "Agricultural Science" in secondary schools can only be superficial at the best.

A glance at the other professions provides evidence of a different kind. There are no school subjects called Dentistry, Engineering, Law, Medicine, or Veterinary Science. Why Agricultural Science?

Junior and Leaving Agricultural Science obviously does not produce agricultural scientists. Nor does it provide suitable introductory education for those proceeding to an Agricultural Science degree. This is recognised by the Faculty of Agriculture of the University of Western Australia which does not require Leaving Agricultural Science for matriculation, and does not even advise intending undergraduates to take that subject.

It is equally clear that this subject does not produce technologists, not because the standards achieved are too low, but because the syllabus has little relevance to their specialised training requirements. I am not aware of any evidence that farmers are the worse for having done Junior or Leaving Agricultural Science, but this seems quite possible, mainly because superficial teaching of intricate subjects is likely to leave the student with some dangerous misconceptions. It is difficult to avoid the conclusion that Agricultural Science as a secondary school subject should be abolished.

However, there is a risk of throwing the baby out with the bath-water. Some (sound) knowledge of scientific agricultural principles ought to be better than none, especially for students in rural areas. How could such knowledge be offered to them if Junior and Leaving Agricultural Science were discontinued? There are a number of possibilities, discussion of which is beyond the scope of this article. My own preference is to teach biology to those students who would have done agricultural science, and

to any others who may be available. Biology, especially if taught with an eye on agriculture, could provide a sound stock of scientific principles, useful both to those entering farming, and to those going on to tertiary education.

The teaching of biology does not provide vocational training for any of the three categories that we have been considering. Such training is best provided by institutions which cater for the specialised fields concerned. In the case of the technologist and the farmer, some vocational training might be undertaken in secondary schools, but there does not seem to be any strong reasons for doing so. Whatever training is offered to those entering farming should, in addition to instilling physical and managerial skills, provide some insight into the nature and methods of agricultural science, and of the kinds of services provided by agricultural scientists and technologists.

At the beginning, I claimed that a simple and important step could be taken towards better agricultural education. The abolition of "agricultural science" as a school subject would be a comparatively simple step, but why important? There are two reasons which immediately suggest themselves. Firstly, by removing "Agricultural Science" from the schools, the serious lack of suitable vocational courses in practical agriculture would become more apparent, and (one hopes) would encourage action directed towards providing them. In a world of rising technical standards, there is a real danger in failing to provide the best and most appropriate vocational training for important industries. Secondly, the removal of agricultural science from the curriculum should help to extirpate the idea that agricultural science is something you learn at school. A better popular appreciation of the nature and scope of agricultural science could be of benefit to the profession and ultimately to the public that it serves.

## Agricultural Education For Western Australia At Other Than University Level



*The Martin Report considered certain aspects of tertiary agricultural education, but its terms of reference excluded consideration of vocational agriculture. Moreover, the emphasis placed by the Committee on the development of training in agricultural technology led it to neglect the need to provide expanded facilities for the training of future farmers in scientific agriculture.*

CONSIDERING the field of agricultural education with the exception of veterinary science, there is a need to provide training in Western Australia for:

1. Research scientists.
2. General and specialist extension officers.
3. Farmers.
4. Experimental and technical officers (technologists)
5. Experimental technicians.
6. Commercial technicians.
7. Skilled farm workers and agricultural contractors.
8. The teachers of 1 to 7.

The University is well equipped to train research scientists, extension officers and the teachers of 1 to 4. Furthermore, it has recently modified its degree course and is planning to add a post-graduate course to provide adequate training for farm management extension specialists.

The other fields of training however, are not co-ordinated under the one organisation, nor is the training provided adequate to meet the needs of modern agriculture and its ancillary services.

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The majority of farmers in Australia still do not receive anything but the most rudimentary formal training for their profession. Much of the training for farming is undertaken in the schools before students have completed their basic education. Yet agriculture is an applied subject which needs a firm grounding in a wide variety of the physical, biological and social sciences. This grounding can be obtained at the schools if the major emphasis there is placed on the core subjects rather than upon agriculture as a sub-leaving subject. Once basic education is completed, further vocational and professional training can then be given. Because farmers in the past have not taken advantage of tertiary education it should not be assumed that the emphasis in agricultural colleges should now be orientated almost exclusively towards the training of technologists. Certainly technologists are needed to support agricultural research workers and administrators in technical operations of experimentation, supervisory duties and routine services. This need, however, should not obscure the even greater need to increase the professional educational level of our future farmers. This need can be met in Western Australia partly by expanding the **post-school** facilities of the agricultural high schools and wings but **mainly** by efforts to up-grade the level of agricultural education at Muresk and make the course there attractive to potential farmers.

The necessary professional training for farmers and technologists could be given at Muresk through diploma courses in agriculture and in agricultural technology for both of which the entrance standard should be matriculation level. Together with the transformed sections of the agricultural high schools and wings, Muresk could be integrated with the College of Technology and associated colleges to provide a comprehensive system of post-school agricultural education at other than university level.

This agricultural education would have three major streams:

1. **Vocational training** in skills and techniques, of use in the operations of farming, farming experimentation, or services to farming.
2. Training in **Agricultural and Ancillary Services Technology**.
3. Training in **Agriculture for farming**.

#### VOCATIONAL TRAINING

This would be by means of evening classes, short courses, and day release courses for trainees in farm work and ancillary services. Entrance would be open to all who had completed minimum formal schooling. Certificates of proficiency would be awarded for individual subjects and these could be aggregated for awards to trainees.

Under this heading there would be courses in:

- (a) Farm skills and techniques such as tractor driving and machinery maintenance; sheep, cattle and other livestock husbandry and skills; farm book-keeping and farm records.
- (b) Ancillary skills such as wool classing, commercial livestock appraisal, welding, metal-work, building and carpentry.
- (c) Short courses in general agriculture.
- (d) Agricultural laboratory and experimentation skills and techniques.

Courses (a) and (b) would provide training for farm workers, farm contractors, stock agents and other workers in farming and ancillary industries and services.

The short course (c) in general agriculture could provide background

knowledge of agriculture for bank clerks, accountancy clerks, local government officials and employees of commercial firms selling to farmers.

The course (d) would be for experimental technicians.

Courses (a), (b) and (c) could be given at the present agricultural high schools and agricultural wings which would thus serve a similar purpose to the Farm Institutes in England and Day-Release Agricultural Institutions in Scotland.

Courses under (d) could be given at Muresk and the College of Technology or associated colleges.

There seems no reason why many of these courses and particularly those under (d) should not be open to females as well as males.

#### TRAINING IN AGRICULTURAL AND ANCILLARY SERVICES TECHNOLOGY

This would be by means of three-year courses leading to a diploma. Entrance standard would be matriculation level in the appropriate subjects.

A prerequisite for the course would be a one-year probationary period in the particular technology during which day release or evening courses in the skills and techniques had been taken.

The Agricultural Technology course would be basically a training for experimental and technical officers and the Ancillary Services Technology courses could develop probably immediately in Agricultural Engineering and perhaps later in Wool Technology and Meat Technology.

The courses would be taken partly at Muresk and partly at the College of Technology, the latter providing the general science and techniques content and the former the agricultural science and techniques.

#### TRAINING IN AGRICULTURE FOR FARMING

This would be by means of a two-year course leading to a diploma in agriculture. Entrance standard would be matriculation level in the appropriate subjects. A prerequisite would be one year's practical experience on an **approved** farm during which day release or evening courses were taken in agricultural skills and techniques.

The course would be basically a training for intending farmers or farm managers, and, as such, would emphasise the integration in the management of a farming business of the husbandries, agricultural, physical and biological sciences and the agricultural social sciences. The course would be taken wholly at Muresk.

Teachers of experimental and commercial technicians, of farm workers and of agricultural contractors would be products of the ordinary teachers training colleges. However they would spend part of their training at Muresk, taking courses in agriculture, and part either at Muresk taking courses in agricultural experimental and laboratory techniques or at the transformed agricultural high schools and wings taking courses in the agricultural skills and techniques. "School" practice could be taken in the appropriate sections at Muresk or the agricultural high schools.

The scheme outlined above is designed to redress the imbalance in agricultural education. At present the only highly trained people are the agricultural scientists and extension personnel. We have very few farmers



trained in scientific agriculture, very few farm workers and contractors have formal training in the required skills, and there is a shortage of agricultural technologists and technicians.

Increase in the numbers of farmers' sons taking formal courses in agriculture is not likely to occur if the status of such courses is low and if there is not a skilled employed labour force available so that those sons do not need to start work on the home farm as soon as they can leave school. Thus, the vocational post-school courses are an essential link in creating environmental conditions which will reduce the pressure on farmers' sons to start work on the farm rather than take formal training for agriculture, or any other occupation.

Removing the practical "third" from Muresk and putting it as a prerequisite should ease many of the organisational problems associated with the course and at the same time give much needed space in the curriculum for more formal lectures.

Up-grading entrance standards and linking with the College of Technology should increase the status of Muresk in the eyes of the farming and general public and lead to a greater measure of support for the large and important contribution it could make to the development of Western Australian agriculture.

R. I. Herriot

## The Agricultural College Viewpoint



*We must think clearly about farmer education, for this is a very important sector, not only of agricultural education, but of education in general. If we recognise that the agricultural colleges are training more non-farmers than farmers now, the need for lifting technological standards will be obvious. In this event, the courses provided will not have less appeal to the farming community than at present. Farmers prepared to send their sons to an agricultural college, after completing a satisfactory course of secondary education, expect much better than is now generally available.*

FOR most of us, education must be purposeful; it is a dynamic business; desirable goals and curricula will change with educational and social progress; so do the ways and means at our disposal. We need to remind ourselves of these things, for it is too easy to train for yesterday.

In Australia, agricultural education is provided by a large number of different institutions, administered by almost as wide a range of different bodies, and it is a matter for common observation that objectives are usually poorly defined.

There would seem to be no greater need at the moment than to decide what the universities will do; what the agricultural colleges will do; what is best for secondary schools and technical colleges; and what might be more appropriately left to the extension service of departments of agriculture or, perhaps to the field of adult education generally.

Having decided upon objectives, it is still a big task to equip the various bodies for their allotted job. Only the universities have properly equipped themselves in recent years. All others are badly in need of attention, and it is to be hoped that the present wave of interest in agricultural education will set them on the road. We certainly cannot afford wasteful overlaps, gaps in our system, or inefficient tools.

The first agricultural college in Australia was established in 1883. At

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that time, and for many years afterwards, there was no such thing as a Faculty of Agriculture as we now know it.

The purpose of the College was quite clear. It was to train young people for farming, who, by their example, would lead the way to agricultural progress.

In those days roads were poor, motor transport was unavailable, there were few telephones, no television, and even such papers as were available arrived irregularly. All this meant that communications were poor and technical information was hard to get. However, there was always a farm to be had, and it could be made productive with little capital and much hard work.

Even with this background, there was much hostility to the newly established agricultural colleges. Diplomates who set out to help farmers were frequently ridiculed. Popular opinion proclaimed that you did not learn farming from professors and books; you learnt it from farming.

After their early years the colleges gained the respect that was due to them, but not always through the farming example set by their diplomates. The greatest impact of the colleges came from those diplomates who chose to work in government departments and private firms which service the farming community. For a long time at least half the students enrolled have been from non-farm, even city families, seeking training to fit them for farming or more often, for non-farm employment associated with agriculture.

#### THE CHANGING ROLE OF AGRICULTURAL COLLEGES

Times have changed, but the basic philosophy that agricultural colleges exist to train young men in farming dies hard. Administrators too, have been slow to recognise the changing situation, and it is little wonder that most agricultural colleges have passed through difficult times during the last 20 or 30 years.

Two other important things have happened. Farming is no longer an occupation for all who desire it. Large amounts of capital are required, and this means that more and more lads who would have gone farming in previous times, are now forced to seek employment in associated non-farm occupations. The demand for technologists trained in agriculture is greater than ever, and more and more agricultural college diplomates are being sought for this work.

#### AGRICULTURAL SCIENCE IN THE UNIVERSITIES

The difficulties of the agricultural colleges have also been increased by what has been going on in the universities since about 1920. Believing that training farmers was still the major purpose of the agricultural colleges, and that those students entering non-farming activities required something better, Australian universities set about developing faculties of agricultural science.

Courses at first were general, and most faculties maintained a working association with an agricultural college. This development, however, had far reaching consequences for all the colleges. Most of the reason for their existence was removed. Their prestige was cut away, and ever since diplomates have fared adversely in employment fields requiring technological

training. On reflection, it is almost incredible that the colleges were able to survive.

It is important that those concerned with the welfare of agriculture in this country should note that the pendulum has now swung backwards. Agriculture has become an unpopular word in university circles and all the emphasis and glamour goes with scientific research.

As a corollary to this, there has been continuing pressure from within the universities to modernise curricula in the faculty of agricultural science. Each review has seen provision for more and more specialisation; for greater depth at the expense of breadth, and even within the universities many influential people are now asking whether there is really such a discipline as Agricultural Science. It is a good question. The tag will undoubtedly persist because of its popularity outside the universities. It is useful for attracting funds but there are very few genuinely agriculturally minded people at present employed by universities, and because of recruiting policy, this position is not likely to improve.

Agriculture may be defined as a more or less complex series of activities concerned with the use of soil and other resources to produce food, fibre, and certain raw materials for industry. It is essentially a dynamic system that is pushed around by the facts of chemistry, physics, biology, sociology, economics and almost every other "ology". Each of these sciences standing alone is not agriculture. Breadth and integration are the keystones of any agricultural system.

Broadly speaking, there are three groups of people concerned with the productive phase of agriculture, and all are equally necessary for national progress in this sphere. They are the researchers, the technologists and the farmers.

There can never be any doubt that the researchers will be university trained, usually in faculties of science or agricultural science. There can be little or no argument against the need for these people to specialise in some branch of science. They need to be trained in depth and they will live in a world of scientific truth, never losing sight of their laboratories and field experiments.

The technologists, on the other hand, are the integrators, innovators, improvisors and interpreters of scientific truth to the farming community. Their orientation will be quite different from that of the researcher. They must be trained in science, they specialise at their peril, and they will seldom lose sight of farms, farmers and farming. Their concern is with crops, livestock and the like, but their medium is usually the farmer who has problems with crops and livestock. To them, scientific truth can be no more than interesting, if the facts cannot be fitted into a workable agricultural system.

At the moment there is a major breakdown in our system of agricultural education in that we are not producing satisfactory technologists, except by chance. Most university graduates are disinterested and ill equipped for the job, and most college diplomates have insufficient science in their training.

Under an ideal system, it is suggested, some university graduates with special aptitudes and background for the task may work as technologists, but in spite of salary discrimination against them, and their deficiencies in science training, college diplomates still hold a major place in this field. With changed objectives and attitudes in the universities, and with improvements in the colleges as foreshadowed in the Martin Report, it

seems certain that the agricultural colleges in future will direct themselves to this specific objective.

#### AGRICULTURAL EDUCATION FOR FARMERS

Agricultural education for farmers is another story. Here are the facts. There are, in Australia, only 250,000 farms larger than one acre in area. This figure has been stable for a long time. We might perhaps think in terms of 200,000 commercial farms, many of which are uneconomic units. On these farms there are employed about 20,000 farmers' sons 12 years old and over, and 80,000 managers and workmen. A rough calculation recognising 25-30 years active life as a principal indicates that about 8,000 new owners or operators are required each year and the odds are greatly in favour of farmers' sons who stand to inherit a farm.

Thus, most lads seeking a life in agriculture must, of necessity, think in terms of gaining qualifications in technology and working in those occupations which service the farming community. This has been happening for a long time. Over the years the agricultural colleges would certainly not have provided more than 2 per cent of potential farm owners in this country. That an agricultural college diploma is only a help towards success in this field is a factual and sobering thought.

For the general run of farmers and potential farmers, it is inevitable that their education shall be provided by the secondary schools, technical schools, adult education services and the extension services of the departments of agriculture. In a properly co-ordinated system, geared to the needs of the farming community, these services would absorb more technologists, as teachers and extension workers, than all existing agricultural colleges can produce. At the moment, the agricultural industries are one of the biggest absorbers of new diplomates and their needs are increasing.

Having set the point that the agricultural colleges must train agricultural technologists, there arises immediately a need to define terms and the objectives for which the colleges must strive.

#### SETTING THE STANDARDS

In my view, an agricultural technologist will be trained to such standard that he will rank for professional status in the organisations that employ him.

He will be an intelligent individual who is socially well adjusted and therefore likely to be acceptable as a professional teacher and consultant.

He will be trained to appreciate and perhaps recognise the agricultural worth of tomorrow's discoveries, and he must be able to grapple with the practical, social and economic problems associated with incorporating these into existing farming systems. He must also be able to interpret tomorrow's scientific discoveries to his employer, if he works in industry, and to the farming community.

This sets a pattern for the development of our agricultural colleges. Nothing less is likely to pull them out of the doldrums, and nothing less is likely to justify their substantial cost to the taxpayer.

The curriculum for an agricultural college producing technologists of standing must include full courses in such subjects as chemistry, biology, agriculture, horticulture, animal husbandry, agricultural engineering and

## A Review of Agricultural Education in Colleges



*Our agricultural colleges provide vocational education and training facilities for less than two per cent of those entering farming. Farming of the future would appear to demand greater technical knowledge and skills for the farm labour force. As it appears that the majority of these will have managerial responsibilities, the provision of adequate management training poses the biggest challenge to education and training for agriculture in Australia.*

“**A**GRICULTURAL education in colleges” is interpreted here to cover all the levels and areas of education for agriculture between those of the secondary schools on one hand and the universities on the other. Therefore the term “colleges” will encompass not only the agricultural and horticultural colleges but also technical colleges and other institutions in which education and training for agriculture is undertaken.

### PRESENT COLLEGE TRAINING FACILITIES

Table 1  
COLLEGE ENROLMENTS IN AGRICULTURAL COURSES, 1963

	Full-time	Part-time	Correspondence	Total
Agricultural colleges .....	1,276	689	—	1,965
Farm-cert. course, Yanco .....	38	—	—	38
Technical colleges etc. ....	417	6,349	3,135	9,901
Totals .....	1,731	7,038	3,135	11,904

(Source: A.C.E.R. Survey, 1964)

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Of those enrolled as full-time students in agricultural courses in 1963, over two-thirds were diploma students in the nine agricultural colleges. Gatton in Queensland was the largest of these colleges, with 422 diploma students. With the exception of Burnley, all agricultural college students were males, in residence. Burnley in Melbourne is a non-residential horticultural college with both male and female diploma students (42 and 15 respectively in 1963) and providing part-time evening courses on a similar basis to the technical colleges. Other colleges provide residential facilities for short extension service courses which are not included here. There was only one non-government college in 1963—Marcus Oldham near Geelong, Victoria. It provides a two-year farm management diploma course. The C. G. Alexander college at Paterson, N.S.W., opened in 1965 on a similar basis. Most of the diploma courses in the agricultural colleges are three-year courses based on two years sub-matriculation level of entrance. Some are two-year courses but these usually demand higher entrance levels. Enrolment in the agricultural colleges increased 10 per cent from 1962 to 1963, and again between 1963 and 1964.

The one-year "farm certificate" course at the Yanco Research Station in N.S.W. commenced in 1963 with 38 students. The majority of the 417 full-time students in the technical colleges were enrolled in certificate level courses of one to three years duration in sheep and wool subjects, mainly wool classing.

Sheep and wool subjects, particularly wool classing, were also prominent as part-time and short courses. Part-time horticultural courses were also popular, particularly in urban areas. Some wool classing courses were provided on an industry "day release" basis, but most courses were organised on the basis of attendance for one or several evenings a week for periods varying from several weeks to several years. Most of the certificate courses covered periods of from one to three years. Almost three-quarters of the total enrolments for part-time agricultural courses in technical colleges were in New South Wales, where over 70 per cent attended non-metropolitan centres. Most of Burnley Horticultural College's 689 part-time students were enrolled in horticultural subjects.

Western Australia, Queensland and New South Wales together accounted for 95 per cent of the correspondence course enrolments in agricultural subjects. Technical education by correspondence was virtually non-operative for agricultural subjects in Tasmania and Victoria.

In recent years, from one-third to two-fifths of the agricultural college students have been farmers' sons, with a further one-fifth being other country youths. About 50 per cent of the agricultural diplomates enter farming while the majority of the remainder enter the wide range of agricultural services occupations. Practically all the diplomates in the "technology" courses (food, dairy and oenology) enter manufacturing industries or government service, while practically all the farm management diplomates from Oldham and farm-certificate students from Yanco enter farming. Three to four per cent of the diplomates enrol for university degrees in agriculture.

Limited information is available on agricultural students in technical colleges but the indications are that the majority of full-time students enter commerce and industry. The part-time and correspondence students are already employed in industry, commerce or farming.

A study of those leaving school during the twelve months ending 31st March, 1960, identified 7,000 male school leavers in Australia (about 1 boy

in 8) as entering an agricultural occupation or commencing full-time sub-university training for same. Of these, 6,509 entered farming, 237 proceeded to Agricultural and Horticultural Colleges and 154 entered training for wool classing. Therefore 93 per cent of those boys identified as selecting agricultural occupations did not receive any full-time agricultural education and training.

Quantitatively at least, agriculture in secondary schools is an important component of our total system of education and training for agriculture. Another important factor is that some 70 per cent of those entering farming are farmers' sons. But the colleges train less than two per cent of those entering farming. Our small extension services are left with an educational task far beyond their resources.

The type of training offered by the two recently-opened non-government agricultural colleges may be an expression of the real needs in this field. Both the Marcus Oldham College and the C. B. Alexander College provide their students with two-years' diploma training for practical farm-management roles.

Another interesting move, which might introduce a new era in education for farming, is the introduction of the one-year farm certificate courses in New South Wales. One course consists of residential instruction at Yanco Research Station and another is the non-residential but full-time "rural course" at Gunnedah given by the local Technical College for young men on farms in the surrounding district.

It appears that there were about 1,000 full-time agricultural students in the agricultural and technical colleges in 1963 who would enter agricultural service occupations. This was less than the number enrolled in agricultural courses in the universities.

The problem for the agricultural colleges has been that they have been expected to be "all things for all people." In conjunction with the technical colleges they have tried to cover all subjects, levels and functions between those of the secondary school on one hand and the university on the other. But the technical colleges, with more facilities, have sorted out their responsibilities into specialist fields and different levels of training, such as technologist, technician, tradesman, and the various art and craft courses. Facilities for full technology training for agriculture have not yet been provided by any of the colleges, agricultural or technical. Although the universities remain as the only source of "agricultural technologists" at present, one must question whether new agricultural graduates have enough "industry know-how" to be true technologists. The Intermediate or Junior level of entrance followed by two or three years of training, which is the basis for most of the major courses in agriculture in the agricultural and technical colleges, is more properly known as "technician level of training."

In the past the agricultural colleges have attempted to achieve a coverage of the arts, crafts, and skills of practical farm operations, training at the technician and technologist levels, some introduction to farm management, and the provision of the equivalent of two-years' secondary education for matriculation purposes, all in three years. The position was made more difficult by the differing educational levels of the students and by the fact that quite a large proportion of the students had urban backgrounds with little or no agricultural experience. Some were training to be farmers, others for employment in professional, semi-professional, management, and for technical roles in government, industry, and com-



merce. The small size, few staff members, and other limiting facilities for each college did not facilitate the introduction of different levels and types of training to meet these needs.

All government agricultural colleges have the avowed intention of reaching technological levels of training and are already demanding better academic standards of entrance and of performance. More science is being introduced into the curriculum on the assumption that it will prove "of great advantage not only to those who subsequently enter a technical career associated with agriculture, but also to prospective farmers." Building and modernisation of facilities is proceeding in several colleges. All this is being done in the knowledge that although the agricultural colleges are much criticised institutions, they have played an invaluable role for Australian agriculture in the past—and have an important role for the future.

#### THE FUTURE OF AGRICULTURE

The planning for all forms of education and training must try to anticipate future needs. Today's students and trainees are the professional leaders and industry operatives of the next forty years. And for agriculture, "the future" and "change" are almost synonymous.

In our agricultural education planning, as a minimum we should anticipate that certain present trends will continue and perhaps intensify. These are:

1. Farming will go on becoming more scientific, mechanised, and complex;
2. The drift of manpower from the land will continue;
3. The expected length of working life will continue to increase.

Thus, agricultural education is needed for a farm work force which will comprise fewer men, each of whom will be taking more responsibility throughout a longer lifetime in a rapidly changing, highly mechanised, commercial agriculture.

#### THE NEED FOR EDUCATION AND TRAINING FOR THE AGRICULTURAL SCIENCES

The continuation of a further important trend should be anticipated in our educational planning. It may be expected that farmers will continue to purchase or to be supplied with an increasing range and amount of "farm-services" from non-farm sources. These include the scientific, technical, management, marketing, supply, labour, information, and educational services for agriculture. Co-ordination in planning and use of resources by universities and colleges is needed to cater for the diversity of these training needs, in range, type and level.

The farm management consultant and club adviser are relatively recent additions to the professional farm-services group. The aerial top-dressers and sprayers have joined the farm-contracting group. The farm-machinery people have replaced much farm labour. The services supplied by the agricultural chemical firms promise to become even more important in the future. Besides materials, technical information and advice are supplied increasingly by commercial firms. And of course, some of the most important of all services are supplied by government agencies, in research,

surveys, regional investigational and adaptational work, extension, marketing, and regulatory work. All available evidence suggests that the demand and need for these types of services for agriculture will continue to increase.

Besides estimating numbers, the desired levels of training must be delineated. It is difficult to get employers to nominate "off-the-cuff" their needs for such, when they have not had the opportunity to employ and evaluate people trained at several different levels.

An industrial rule of thumb is that for every back-room engineer or scientist, three technologists are required to make his ideas work, and each technologist needs three to five technicians to follow through. These in turn are supported by tradesmen—and so on. Unfortunately, the needs for agriculture are less clear cut, although the agricultural services could be categorised more thoroughly if studied intensively enough. But available evidence suggests that training at several levels is and will be needed—and that the sub-university output is far too low.

Assuming that the universities meet the challenge of supplying scientists, economists and special types of technologists and management people for agriculture, the "colleges" are left with a tremendous challenge to train the people for all the other types and levels of work in the agricultural services. The potential roles of the college-trained agricultural technologist and agricultural technician are most apparent for the fields of agricultural engineering (both civil and mechanical), soil and water conservation, the dairy, food, and fibre processing industries, and technical sales and services. But one can foresee the day when possession of a certificate of competency will be demanded for agricultural spraying contractors and similar people supplying services to the farmer; when Department of Agriculture inspectors and other technical staff will have to be trained formally at least to the agricultural technician level, and when classers, graders, and sorters of agricultural produce for sale overseas or locally will have to be officially registered after receiving certain training and experience. All these needs, present and future, will have to be met by our "colleges."

#### THE NEED FOR EDUCATION AND TRAINING FOR FARMING

The most complex, difficult and neglected field in education and training for agriculture in Australia is the provision of adequate facilities for those who will make the future managerial decisions on Australian farms.

The (Martin) "Committee on the Future of Tertiary Education in Australia," and other bodies, have emphasised the need for a broader education for those science and technology trained people who will have management roles in industry, commerce, and government. This would appear to apply equally well to those in agriculture. But I must question the Martin Committee's statement that "The general problem of educating people for work on the land is similar to that which exists in other callings."

Australia has a quarter of a million farms, and this number is relatively stable, showing only a small decrease over the past few decades. But the numbers of people working on these rural holdings have decreased more substantially, and the trend is continuing. Official statistics show that the numbers working on rural holdings decreased by 12 per cent in Queensland and 11 per cent in Tasmania over the four years 1958 to 1962, with smaller decreases in other states.

The long-term trend for a decrease in those working on farms is largely accounted for by the decrease in the paid farm employees and the unpaid farm-family labour. The number in what we may call the farm-managerial group has remained relatively constant. In 1958 (the last year for which complete statistics are available) there were half a million persons working on rural holdings in Australia—some 11 per cent of the national work force. Of these, about 100,000 were temporary employees, and a quarter of a million were classified as owners, lessees, or share-farmers.

The fact that two-thirds of the permanent work force and over one-half of the total work force on Australian farms are decision-making producers, does, I suggest, present problems for education and training of people for work "on the land" which are very different from most other callings.

Capitalisation for present family-sized farms ranges from, say, £20,000 to £50,000, with many properties having a much higher figure. If we accept the increasing complexity of farming, management training will assume greater importance in the future. Most people appear to accept this. But few people appear to appreciate the magnitude of the task. We have a quarter of a million people in the farm-managerial group—over one half of our present farm work force and about one twentieth of Australia's present total work force. What other calling has a management training problem of comparable magnitude and complexity?

The proportion of work on farms which can be done by unskilled labour is decreasing. Fewer people on farms are taking greater responsibility for higher production, using machinery, chemicals, and other inputs of increasing variety and complexity. We must face a future when all people on the land will need more technical understanding and skills. Since they will be taking more responsibility, farm employees also will be making more decisions than in the past. A man killing weeds chemically from a tractor spray at, say, 10 acres to the hour, needs to be more technically trained and alert than one burying weeds with a horse plough at an acre per day.

Because of the very nature of agriculture, we cannot use mass production-control methods to the same degree as in urban industry. Therefore our system of education and training for farming must aim at producing people who are markedly individuals, who are receptive to new ideas but can think for themselves, who can take rapid and correct decisions, and who have skills to supervise or do the actual job themselves. This is the most complex, difficult and neglected field of education and training for agriculture in Australia.

## Technical Training For Agriculture



*Recognition of the growing shortage of trained personnel in the State, and our need for a fully trained work-force at all levels, have been some of the considerations which have led to the launching of Technical Training Year 1966 in Western Australia. The year will successively focus on different major occupational areas. During each focus, the employment opportunities and training demands of the particular field concerned will be highlighted.*

I SHOULD emphasise that I am not writing as an expert, or even as a participant to any significant extent in the field of agricultural education. Rather I write as one with some general views on technical training which seem to me to have some possible relevance to the field of agriculture, as they have in many other fields. However, it will perhaps be appropriate for me to begin by indicating the part played by the Technical Education Division in providing courses for those engaged in agriculture. I will then end with some comments on Technical Training Year 1966 in Western Australia which will include agriculture within its ambit.

### AGRICULTURAL EDUCATION IN THE TECHNICAL EDUCATION DIVISION

The earliest entry of Technical Education Division into the field of agricultural education was in woolclassing. A course leading to a vocational qualification in this field has been offered for many years. More recently the course has been based at Fremantle because of its proximity to the wool stores and the wool scouring plants. In a sense it may indeed be said that woolclassing instruction was provided as an adjunct to commerce rather than to agriculture.

This is changing. In recent years there have been demands for classes in various country centres such as Geraldton, Albany, Mt. Barker, Manjimup and Northam though these courses do not necessarily cover the same

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ground as that at Fremantle. Short term intensive courses are provided at Fremantle in January and February. Day release classes are provided during the year for the staffs of major wool-handling firms, and now there is a one year full-time course. This is mainly directed at young people who have completed the third year of high school. A number of these are farmers' sons. There has therefore been a considerable growth in woolclassing instruction in recent years and special facilities have been provided at Fremantle Technical School which will be much improved when the new school at Fremantle, now being planned, is completed.

Apart from this, the major activity of the Division in agricultural education has been in correspondence courses. A wide variety of these are provided covering various aspects of agricultural science, animal husbandry, farm engineering, and farm bookkeeping and management. More recently, provision has been made for various groupings of these subjects to lead to a certificate in agriculture. This certificate is offered in three major fields, namely, Agriculture, Sheep and Wool, and Agricultural Mechanics.

The inclusion of several engineering and mechanical maintenance subjects within these courses reflects the growing mechanisation of the agricultural industry. This is also being reflected in demands for allied subjects in various country centres. Welding, metalwork and farm bookkeeping are particularly popular. This trend towards a growing relationship between agriculture and allied fields is also typical of developments overseas. During the course of a world tour last year, I called at the California Polytechnic in San Luis Obispo. Agriculture is one of the strongest courses in this college, which grants a degree but is essentially directed towards the education of practitioners rather than those who will do research. I was told that only 40 per cent of the students are engaged in the traditional field of agricultural production. The remainder are engaged in agricultural engineering, agricultural marketing, agricultural management, etc.

This trend is not confined to agriculture. It is only a particular example of something which is much more general. Thus there is a growing demand for trained personnel who span related fields, such as building and management, engineering and industrial design, and commerce and technology. Technical education caters for several fields of study and training of which the relevance for those engaged in agriculture is becoming evident. It therefore appears likely to be called upon to play a greater part in the future in meeting the educational needs of the agriculturalist.

There is a second trend which is also of significance. This is the growing appreciation that in today's work force everyone needs training. This seems to me as likely to apply to agriculture as much as to any other occupational field.

Technology in agriculture is increasing. Attractive wage rates in today's labour market can only be offered to agricultural workers who are highly efficient and productive. In many cases farms have to be operated as one-man shows because of the labour problems. All these add to the demands for a high level of training, not only initially, but on a continuing basis.

This was emphasised to me by a visiting principal of an agricultural college who was in Perth for the recent Conference of Agricultural College Principals. He expressed the view that appropriate education should be

more readily available to the agricultural community, and that State technical education systems with their wide network of facilities are obviously important avenues in this respect. In his view, part of his job was to produce teachers for this purpose.

#### THE MARTIN REPORT AND AGRICULTURE

One of the less publicised aspects of the Martin Report on Tertiary Education in Australia is its statement of the important principles which I have been discussing, namely that of a totally trained work-force. The committee recognised that its terms of reference confined its considerations to the professional levels of training. It nevertheless expressed its overall concern. It is important to keep this in mind in view of the fact that in building up our professional level institutions it is possible to lose sight of the needs of the other workers in the field. I am not speaking here specifically of agriculture, but talking of a common problem.

Not only is it a common problem over a wide range of occupations, but it is also evident in other countries. Following the Robbins Report on Higher Education in Great Britain, complaints are heard that higher technical institutions are often deserting the fields for which they have traditionally catered, and are doing this without ensuring that adequate alternative provisions have been made to meet the needs of the groups concerned. In America, too, this problem is evident.

There is a great tendency in education to confuse level with quality and difficulty with importance. When educationalists talk of raising the quality of education what they often mean is raising the level to which they seek to bring their students. It would seem to me that raising the quality of education should mean training people more efficiently at whatever level is appropriate to them and to the needs of the employment market. An Educational programme for operatives can be of very high quality while it is quite possible for Ph.D. programmes to be of very poor quality indeed. Putting quality into our education does not therefore mean seeking to bring everyone to professional standards, but rather seeing that we have a highly efficient system of education to meet the needs of semi-skilled workers, skilled workers, and various grades of technicians as well as providing full professional qualifications.

Equally there is a tendency in education—and in the community for that matter—to attach greater importance to that which is abstruse, difficult, and complex, simply because it has these qualities. In fact these may not be the most important things for the individual to learn either from his own point of view or from the point of view of the community. Some people need very much to be taught some apparently quite simple things. In fact this is what is appropriate to their ability and this is what is important for them. On the other hand a high failure rate in a course proves nothing with regard to its quality or its importance though it may indicate a good deal concerning its level and its difficulty.

I am not really in the position to say how these issues apply to agricultural education, but it has given me great concern recently to hear two senior officers of interstate agricultural colleges who have given addresses on agricultural education. They have emphasised that colleges must raise their sights, their entry levels, their length of training, and their status, without making reference in any way as to what should happen to those

with whom they have been traditionally concerned but for whom a professional level of education is not appropriate. In particular their message has been that agricultural colleges should no longer be concerned with the education of farmers which, in fact, they say, is becoming an embarrassment to them in their forward development.

I am not questioning that the role of the agricultural colleges may well be changing and that they may indeed be right in their basic contentions. What concerns me is that such discussion tends to stop at this point, and there is no further exploration of what alternative provision is needed for those who have been their concern but apparently now are not properly so. I am concerned because this appears to me to be part of a general trend. Professional groups are continually concerned with driving onwards and upwards leaving behind them unfilled gaps which are neither really in their interests or those of the community. A modern community requires adequate provision for the training of all personnel at all levels and if this is not recognised by the most highly educated, professional groups, then by whom will it be recognised?

It was in the light of this principle that the Technical Education Division was happy to respond to a demand to provide a course for agricultural technicians at research stations and in laboratories. This was commenced in the current year. It is set out as a four year part-time course commencing from the completion of the Junior Certificate, and the later years being provided through the Perth Technical College. The earlier years are Leaving Certificate subjects and are available in many places. There are surely other courses at various levels likely to be required in the field of agriculture in the coming years.

The recent comment of a British writer is perhaps appropriate here. He says, "Ought we not take our eyes off the Academic League Tables (or should we change this to the Academic Stud Book) so that we can concentrate on the real job of producing the sort of trained people the country really needs."

#### TECHNICAL TRAINING YEAR 1966

Recognition of the growing shortage of trained personnel in the State, and our need for a fully trained work-force at all levels, have been some of the considerations which have led to the launching of Technical Training Year 1966 in Western Australia. This programme has the full support of the State Government. It is aimed at encouraging more people to seek training. It is also aimed at convincing the community in general, and employers in particular, that we can only have sufficient trained personnel if we have sufficient training facilities. This means not only facilities in educational institutions, but in business and industry itself where much of the training must of necessity be carried out in the factories and offices and on the farms.

The project has been received with enthusiasm, and upwards of 300 people from government, business, and industry—including the agricultural industry—are actively engaged on committees and sub-committees developing the programme for the Year.

During its course from March to October 1966, the Year will successively focus on different major occupational areas, such as health and welfare, building and construction, science and engineering and so on. One of these

will be Focus on Primary Industries. During each focus, the employment opportunities and training demands of the particular field concerned will be highlighted. This will be done through display material which will be made available to every school in the State with secondary level students. With this display material will go appropriate literature for distribution.

Other displays may well be organised, or there may be seminars and discussions arranged. The work of the educational institutions in the particular field will be emphasised. There will be appropriate radio, TV and press material, and in some cases appropriate interstate conferences have been attracted to this State. In all, 14 such conferences have already been arranged and more are in the process of negotiation. One of the highlights of the Year will be a Pan Indian Ocean Conference on Technical Education and Training which will be discussing the relationship between technical education and industry in the production of a trained work-force.

Those engaged in agriculture will be interested in the Year from two points of view. On the one hand they will no doubt be anxious that their industry will be adequately represented in the activities of the Year. They will therefore want to give their full support to the Primary Industries' Sub-Committee which has this responsibility. Secondly, many of them are parents and they will be interested to know that special efforts are being made to serve our country areas. In particular the State will progressively be covered with Career Days in secondary schools and where possible with other appropriate activities.

Representatives of the Farmers' Union in every part of the State are receiving Technews 66, a regular bulletin of information concerning the Year and its activities. We hope that the information in it will be studied and passed on so that more and more people throughout this vast State will become more conscious of the vital part which technical education and training must play in a modern community.

"Training for Development" is our theme in Technical Training Year. Both in terms of our State and of each individual in it, what theme could be more appropriate today?