1955
Farrer Memorial
Oration . . .

PRACTICE WITH SCIENCE

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"Those who affect to despise theory will do well to recollect that a function of theory is to examine the foundations of practice and by this manner to modify it and extend it advantageously." W. J. Farrer—"Grass and Sheep Farming, A Paper Speculative and Suggestive," 1873.

THE title I have chosen is the motto of the Royal Agricultural Society of England—an organisation noted for its encouragement of the adoption of the findings of science to agricultural practices.

Farming is a most complicated business. Many of the problems of the farmer are as old as agriculture itself but new problems are arising constantly. The function of agricultural education is to discover solutions of these problems and to bring the findings—the accumulated knowledge and experience of the past, the unchanging and established principles of succeeding generations and the newer discoveries of science—to farmers for application by them to their farming enterprises.

Although from the earliest times agricultural writers, including Virgil, Columella and Cato, referred to the importance of knowledge in agriculture, it seems that in Great Britain organised instruction in "the oldest of the arts and the youngest of the sciences" was not in operation until towards the end of the 18th Century and the first agricultural college was not established in England until 1845.

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Wentworth's Suggestion

In New South Wales, while one reads constantly in the earlier despatches of lack of efficiency of the farmers, it was not until 1818, the latter part of Governor Macquarie's period, that there emanated from the fertile brain of William Charles Wentworth the first suggestion of an agricultural college. Thus he writes: "One of the most efficacious measures that could be adopted would be the establishment of a colonial plantation in which a certain number of the most enterprising youths might be instructed."

Again, in 1856, efforts were made by the Agricultural Society to establish a "model or experimental farm" but without success.

William Farrer, in the pamphlet cited at the head of this paper, deplored the lack of teaching of pastoral science, and went on to say "It remains of course to be seen how long it will be before technical education becomes properly appreciated in the Colony. That it will be established here at some not very distant day I have not the slightest doubt, for the spirit of the age has, during the last four years, shown us too plainly ever to doubt it."

In 1874 the draft of a Bill to provide for "the creation of a Department of Agriculture and the establishment of an Agricultural College and other agencies for imparting instruction in, and disseminating information relating to agriculture" was prepared, but from some cause or other the matter was then allowed to drop out of notice.

The reasons for this late appreciation of the need for agricultural education were probably that the early settlers found a vast realm of new areas with virgin land and fertile soil. They worked out a block and then sought "fresh woods and pastures new" in the "stations further out". They hardly had need to worry over problems of soil fertility, weed and plant disease and insect pest control, erosion, overstocking and such matters as "the problem of the surplus". Even later, when agriculture became more complicated, the farmer himself and his attitude have lagged behind the change.

So it was not until 1890 that the Department of Agriculture was brought into being and on 16th March, 1891 the Hawkesbury Agricultural College was formally opened at Richmond.

Farrer and the College

As indicated, Farrer had, as long ago as 1873, interested himself in the subject of agricultural education, and I think it is of interest therefore, to digress at this point to relate briefly Farrer's contact with Hawkesbury Agricultural College.

Russell in his book "W. J. Farrer" records that in 1889 Farrer, in one of his many letters to Blount in the United States of America advised him of a position about to be created at a "new agricultural college"—presumably Hawkesbury.

E. A. Southee, Recipient of the 1955 Farrer Memorial Medal.

It is of interest to note from the annual report of the College for 1893 that "the presentation of the first diplomas was honoured by the presence of—among others—Mr. Farrer, Queanbeyan."

In that same report the College Experimentalist drew attention to "an experiment with sixty-five varieties of wheat reputed to be rust-resisting." Apparently Farrer, even before his appointment as Wheat Experimentalist in the Department of Agriculture in September, 1898, had made use of the College and from that date made frequent visits in connection with his breeding work.

The College report for 1899 mentions that the experiments undertaken on behalf of Mr. Farrer covered an acre and a half. Mr. (now Dr.) G. L. Sutton was in charge of the wheat-breeding experiments at the College while Experimentalist from 1900 to 1904, when he was selected, on the recommendation of Farrer, for the position of Manager of Cowra Experiment Farm, where he bred or helped in the breeding of wheat varieties of continent-wide reputation. He continued this work when he later became Director of Agriculture in the Western Australian Department of Agriculture. He was awarded the Farrer Memorial Medal in 1937.

In 1905 Farrer reported: "The experiments which are carried out at the College are mainly for the purpose of testing the rust resistance of varieties . . . the Hawkesbury College farm is a very important station." The College report for the same year indicated that "over 400 strains were grown". In 1907 over 500 strains of bunt and rust-resisting wheat were grown.

Some time after the death of Farrer in 1906, his breeding work in wheat, oats and other cereals was entrusted to J. T. Pridham, H.D.A. (Dux 1900) who had enjoyed personal association with Farrer. Mr. Pridham delivered the Farrer Memorial Oration in 1944.

Continuously from 1907 extensive trials of hybrids from the inland farms of the Department of Agriculture have been carried out annually at the College, mainly for disease resistance and suitability as hay wheats.

A vigorous programme of breeding was instituted by Mr. (now Dr.) W. L. Waterhouse, H.D.A. (1907) in the early 1920's and this has continued to this day. Each year areas are sown for field trials for Dr. Waterhouses' rust investigation work in association with the University of Sydney. Dr. Waterhouse, who was the first recipient of the Farrer Memorial Research Scholarship, holds the unique distinction of being awarded the Farrer Memorial Medal on two separate occasions—he delivered the Farrer Memorial Oration in 1949.

THE FARRER MEMORIAL MEDAL is awarded annually to commemorate the work of Australia's great wheat breeder, William James Farrer, and to mark distinguished service to agricultural science. The oration by the recipient is an important item on the programme of the congress of the New South Wales Agricultural Bureau at which the award is made.

It was singularly appropriate that in 1912 the services of William James Farrer to the State should be commemorated in the form of a Government Farrer Scholarship, tenable at Hawkesbury Agricultural College.

Agricultural Education and the Farmer

Resuming now the main theme of this address it is proposed to deal more particularly with the relationship between agricultural education and the farmer.

The motto chosen for the College was from the Georgics of Virgil and in broad translation reads: "The Great Father hath ordained that the way of the man on the land shall be no easy one."

Agricultural education, in one form or other of its triune function—research, extension, resident instruction—aims at making this task lighter, at softening the asperities of sudden changes in practice and outlook, leading to a degree of efficiency which could not otherwise be reached, except by long and costly effort.

In view of their obvious direct concern to the practising farmer, discussion will be centred on the research and extension aspects of agricultural education.

In recent years food production has been highlighted all over the world from the point of view of "feeding a starving world" and in Australia more particularly from the point of view of our national economy and balance of trade.

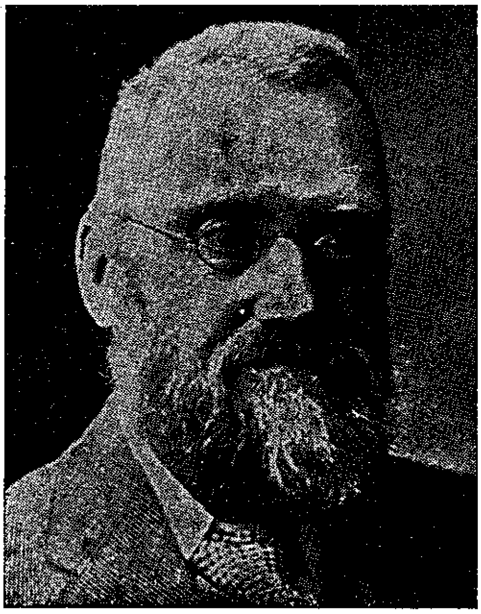
In December, 1952, in his foreword to "A Statement Explaining the Agricultural Production Aims" approved by the Australian Agricultural Council in April, 1952, the Minister for Commerce and Agriculture, the Hon. J. McEwan, said—

> "The Commonwealth Government has decided to adopt as its policy objective a Commonwealth-wide programme of agricultural expansion, not only to meet direct defence requirements, but also to provide food for the growing population, to maintain our capacity to import, and to make our proper contribution to relieving the dollar problem."

The "statement" indicated that from 1939 to 1952 the population of Australia had increased by some 24 per cent. while agricultural production had increased by only 12 per cent.

William James Farrer

—1845-1906—



Son of an English farmer, Farrer came to Australia in 1870 and was a surveyor on the staff of the N.S.W. Lands Department. In 1898 he was appointed to the staff of the Department of Agriculture following the recognition of the value of his experiments with wheat. For his work as a wheat breeder, Farrer has been termed "Australia's greatest benefactor", pioneering the development of varieties suitable to Australia and making possible the extension of our wheat-growing areas by millions of acres.

The Minister also said that "the bulk of the increased production must come through higher productivity in existing farms".

Agricultural authorities have averred that "future progress will be made in the better rainfall areas and here virtually all the areas of good soil, particularly in southern Australia, have been brought into use".

Greater production seems, therefore, to depend on greater efficiency in the enterprises already established—to answer the call for maximum efficiency (not only in quantity but also in quality) there is no question but that attention must be given to the proper and thorough training of the farmer.

"Tempora mutantur et nos illis" applies particularly to agriculture. To-day the practice of agriculture has travelled a long way from the time it was carried on largely for self-supply; almost every condition of the old order of farming has been changed.

In these changing times research, discovery and invention have brought about a rapid development in the art, science and business of agriculture—the series of integrated activities which together constitute the total pattern of farming.

These developments have changed farming from a more or less hit-or-miss occupation to one of the most complicated trades and businesses—to a profession requiring as much real training and scientific and economic knowledge as any other business or profession.

Farm income and farm life are being influenced more and more by what takes place beyond the fences of the farm, and the farmer needs a form of education which will provide new methods to increase production, meet competition and reduce costs of production also help him to think about and better understand the economic facts of consumption and production and markets, both domestic and foreign, as well as the background of national and international agricultural policies.

It is clearly of advantage that the farmer be equipped to realise the importance and significance of progress and learn to make full use of the information arising out of research—material and economic—by the various government and private organisations and institutes concerned.

THE CONTRIBUTION OF AGRICULTURAL RESEARCH TO AGRICULTURE.

In the introductory chapter of his "Grass and Sheep Farming" (1873). Farrer comments:

"It reflects little credit on the colony that no analysis of even a salt-bush plant from the interior has yet been made . . . I entertain, however, a sanguine hope that at some future day, even pastoral science will be taught in the colony and then these valuable researches will probably be made."

Later on, in the 1890's, he received the full measure of assistance from research men of the Department of Agriculture, notably N. A. Cobb and F. B. Guthrie.

The age in which we live is distinguished from all other periods for its dependence upon, and faith in, scientific research. The farmer's success, in a material sense, is wholly dependent upon the control he is able to exercise over his environment. The basis of progress is reliable knowledge that is continually advancing and expanding. This knowledge may be gained either by experience in the "school of hard-knocks" or through scientific research. The former method is slow and costly of human energy and materials. Agricultural science, while recognising all that is valuable in tradition, breaks away from its dominance and uncompromisingly and with open mind seeks to discover the forces of nature on which plant and animal production depends, how these forces operate and how they may be useful to the farmer.

New Forces

From fundamental discoveries in the laboratories in universities, colleges and research institutions and from researches at the experiment stations and in the field often emerge new forces. These may not only revolutionise farm practices but may also quickly come to exert a tremendous influence in solving the problem of an adequate "world's food supply".

While there may have been earlier isolated contributions the 1840's might be considered as ushering in the era of agricultural research. Lawes had inherited Rothamsted in 1834 and commenced "private experiments in the growth of crops. In 1843 he arranged for the chemist, Gilbert, to join him, thus establishing the Lawes and Gilbert tradition, associated with the foundation of the world-renowned Rothamsted Experimental Station.

A cereal specialist of the Department of Agriculture discussing a breeding trial with farmers.

Just about this time too, in 1840, Liebig's "Chemistry in its Application to Agriculture and Physiology" was translated into English. It was in 1842 that Lawes first took out a patent for the manufacture of superphosphate.

It may be of interest to note that the first factory-produced reaper appeared in 1847 and the first separator in 1884. In Australia Ridley had invented the stripper in 1843 and McKay had produced the harvester in 1884. The first refrigerated cargo went overseas in 1879.

Earlier researches were concerned with the soil, the use of fertilisers, the principles of breeding and feeding of livestock, the control of plant and animal disease and the production of better varieties of crop plants. More recently—since World War I—greater attention has been paid to crop husbandry, preventing soil repletion, better methods of control of pests and diseases and weeds, and to the increased use of mechanical equipment on farms.

Crop Improvement

Improvement in varieties of crops by breeding and selection has been one of the most fascinating chapters of recent agricultural history—William James Farrer and those who have carried on his good work have established an outstanding name for Australia.

With the increasing knowledge of genetic principles and their application there have come about remarkable improvements in yielding ability and other desirable characteristics, for example in quality, disease resistance, drought resistance. As a direct outcome of research in genetics the introduction of hybrid maize brought about a spectacular increase of 20 per cent. in yield of maize in the corn belt of U.S.A.

Here in New South Wales the "Agricultural Gazette" for November, 1954 records: "The development of hybrid maize resulted in a gain in the 1952-53 season of 9.6 bushels per acre and maize growers are benefiting from this aspect of research by about £250,000 a year."

Farmers generally are aware of the remarkable advances in methods of farm operations, e.g., contour ploughing, stubble mulching, strip grazing, aerial seeding and spraying, progeny testing, artificial insemination, Mules' operation, myxomatosis, beef air transport; and the development of fungicides, bactericides, pesticides, larvicides, herbicides and weedicides. Penicillin, sulpha drugs, anti-biotics, strain 19, D.D.T., B.H.C., aldrin, dieldrin, parathion, H.E.T.P., 2, 4-D, L.B.E., have become as "familiar as household words".

During the last twenty years or so increased attention has been given to the role. in both crop and animal production, of "trace elements", that is those elements which are essential for normal growth but only required in very small quantities. The absence of these trace elements has given rise to what are known as deficiency diseases and to other conditions such as "steely wool". which is due to lack of copper in the soil.

Apart from the well-known effect of iodine and cobalt in the control of deficiency diseases in animals two outstanding results from research on "trace elements" are worthy of mention:

The control of "whiptail" in cauliflowers by the addition of very small quantities of molybdenum to the soil.

The conversion of the "Ninety Mile Desert" to a "Ninety Mile Plain" at Coonalpyn Downs in South Australia by the addition of copper and zinc to the soil.

Recent research on pasture management and improvement has multiplied many times the potential area for more intensive production of livestock and crops.

The first issue of "Rural Research" by C.S.I.R.O. in 1952 records: "The addition of molybdenum and other elements could give anything up to an eight-fold increase in the carrying capacity of some millions of acres of tableland country in south-east Australia."

In No. 3 of the same publication in March, 1953, one reads: "It is possible that the present 18,000,000 acres of improved pasture can be expanded to 300,000,000 acres."

In May this year the Minister in Charge of C.S.I.R.O., Mr. Casey, told Federal Parliament that more than 200,000,000 acres of undeveloped land in Australia could be improved by the use of trace elements.

Mechanisation

The great advances in agriculture through the application of research could not have had their maximum effect without concurrent developments in machinery.

The impact of the development of research in the development of machinery is well-known—Australia has not been behind in this work, particularly in the development of machines and implements to meet the peculiar requirements of the nation. One mentions the stripper, stripper-harvester, header-harvester, reaper-thresher, auto-header, stump-jump plough, sundercut, mallee roller, stubble mulcher, rotary hoe.

The great effect of "mechanisation" can be gauged from the following statements from U.S.A.:

"The number of farm workers will drop from 9.3 million in 1952 to 7.8 millions—a drop of 16 per cent.—in 1960 and to 5.8 millions (drop 37 per cent. by 1970).

"Each man-hour of farm labour meant 44 per cent. more gross production in 1945 than in 1921.

"The introduction of the aeroplane for cotton dusting in 1952 reduced the time required from 60 hours for five men to 30 minutes for five men."

The realisation of the advantages of mechanisation in helping to solve our war-time food problems gave rise to a spectacular increase in machinery used in the years following World War II—this may be seen from the following figures (cf. Fig. 1.)

Tractors (*Australian*): 1939—41,943; 1945—59,509; 1951—123,173; 1953—158,382.

Milking Machines—Units (*N.S.W.*): 1939—8,119; 1945—25,177; 1951—35,517; 1953—38,260.

Pick-up Bailers (*Australia*): 1950—one per 100 farms; 1953—eleven per 100 farms.

So far I have dealt with the contributions of agricultural research to what might be termed the technique of farming—the art and the science of agriculture.

Nowadays agriculture has come to be considered first and foremost as a business, and criticism has arisen that the efforts of agricultural research have been concentrated too much on the "optimum" as measured by the quantity and quality of production, rather than by the financial returns. Technological research workers do, however, realise that the ultimate justification for their activities must be found in commercial benefit to the farming community. After all, better farming must be associated with "maximum net profit" for the farmer.

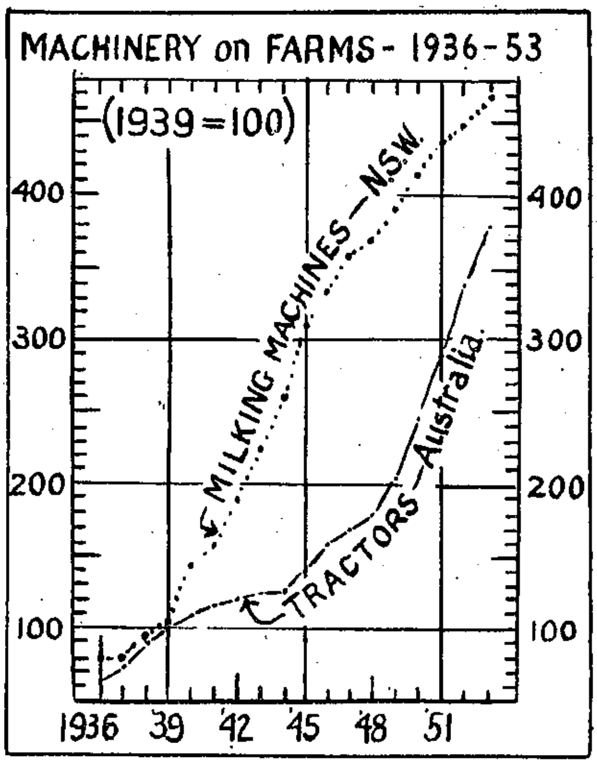


Fig. 1.

Research in Economics

In the efforts to balance "production" with "demand" and to prevent "useless" farm expansion it may seem that the farmer has cause to quarrel with science—however, it is evident that what is needed is not less science in production, but more science in distribution, involving, in the long run, more education—research—in agricultural economics and the business of farming.

The Commonwealth Bureau of Agricultural Economics, and, in this State, the Division of Marketing and Agricultural Economics of the Department of Agriculture, have concerned themselves with, among other activities, research into problems of farm management and farm income. Investigations into the economics of farm practices, such as fertilizer application, feeding, machinery use, pasture management, methods of performing farm operations, combinations of enterprises, have provided a basis for intelligent production programmes through better organisation, lowered costs and wise use of credit. An answer has been sought to the farmer's questions "Will it pay?" and, if so, "Will it pay better than existing methods or practices?"

Among marketing problems attention has been given to detailed analysis of the "price structure" of our agricultural products, particularly with respect to the "spread" between consumer and producer prices.

Another important field of agricultural economics research has been to investigate the implications of and analyse the effects on the Australian farmer of national and international policies—tariffs, bounties, quotas, embargoes, restrictions, marketing boards, trade agreements, guaranteed prices, stabilisation, equalisation, wheat agreements, the Colombo Plan, GATT, and international organisations, U.N.O., F.A.O., Unesco, W.H.O., Anzus Pact and I.F.A.P. These must be interpreted so that the individual farmer—and farmers' organisations—may better understand their influence on his own and his neighbour's procedure in the marketing of his product, and so that he may adjust himself to constantly changing conditions.

EXTENSION—Interpretation of the findings of agricultural research and dissemination of knowledge and information thereon among practising farmers.

While the discovery of new truths is essential to progress, it can but count for little unless carefully checked and tested information concerning up-to-date knowledge of new facts, new methods and new practices arising from research is disseminated widely and promptly among farmers and promulgated in such a way as to encourage and enable individual farmers to put them into practice.

The results of research and experiments must be interpreted into everyday usable ideas and practices that would pay the farmer to adopt and help increase his farm income.

Extension flows from and is complementary to research and involves ways and means for the application of knowledge to the actual situation of the farmer—successful introduction of a new technique requires careful consideration of the farmer's physical and social environment and, above all, his prosperity.

I should imagine that all farmers are aware of the sources of extension services—radio, press, journals, pamphlets, lectures, field competitions of the R.A.S. and local agricultural societies and farmers' organisations, schools for farmers, correspondence courses and the public library. It is generally agreed that the extension services, which aim to contact the individual farmer, are most effective.

The time lag between "Science" and "Practice": In spite of all that has been done in recent years to improve the methods of ensuring that the farmer is made aware of new developments in agricultural research there is a considerable—perhaps too long—but not wholly avoidable period of time existing between the findings of the scientist and their utilisation on the farm.

Ridley invented the stripper in 1843 but according to Wadham (Australasian Association for the Advancement of Science, 1935) "it was not until the 'seventies that the machines reached northern Victoria".

In 1890, Professor Lowry of South Australia, amid great initial opposition and prejudice on the part of farmers, vigorously advocated the use of superphosphate for wheat, but it was only after a quarter century of intensive effort that the practice was generally adopted.

Farrer produced his Federation wheat in 1901—it was not until about ten years later that it became the most popular variety in cultivation although it retained that position for another fifteen years to 1925.

Gruen in a recent article on "Superphosphate use in N.S.W." (Rev. Mktg. and Ag. Ec. 23) showed that before the war approximately 15 per cent. of all graziers on the Tablelands dressed part of their pastures with superphosphate compared with 45 to 50 per cent. in 1954. (For the Northern Tablelands the figures are pre-war 4 per cent., 1953-54, 40 per cent.)

One finds a similar slow annual increase in the use of tractors and milking machines on farms pre-war compared with post-war figures. (c.f. Fig. 1.) A considerable portion of this "time lag" is taken up in the period required by the personnel of the extension services in confirming principles by further experiment, in adapting these to the various practices and farming systems of diverse areas and individual farm environments—physical, economic and maybe, psychological and sociological—before satisfying themselves that they can confidently recommend them to farmers. Added to this is the time required to study the likes and dislikes of the farmer and overcome his indifference, inertia, shyness and prejudices.

Rural people are traditionally individualistic, conservative and independent in outlook, and aware of the uncertainties of yields and prices—they are slow to change and not prepared to do so until the profitableness of a new procedure is determined.

ATTITUDE OF THE FARMING COMMUNITY TO AGRICULTURAL EDUCATION.

The Rural Reconstruction Commission, in its 6th Report (1945) comments (page 58): ". . . the general problem is difficult because of resistance on the part of some farmers to educational services."

Later on it quotes evidence from the N.S.W. Department of Agriculture: "There is, perhaps, no more difficult aspect of agricultural education than that of instructing the adult farmer."

It mentions the opposition of "unprogressive farmers" to "what they are pleased to term the new fangled ideas of College and University theorists."

For a long period the work of the agricultural scientist was received not only with scepticism, distrust and suspicion but also with open and violent antagonism.

As far back as September, 1822, a Chester (England)paper reports: "On Wednesday last, about thirty labouring hands assembled in a tumultuous manner on the premises of Mr. Pearce, farmer of Foxhill, in Suffolk, and threatened that if he persevered in the use of the threshing-machine, they would set fire to his premises."

The report concluded: "On Thursday morning it was found advisable to call in the Suffolk Yeomanry Cavalry, by whom six of the offenders were secured, and safely lodged in prison."

William Farrer in the early days of his researches was regarded by most farmers as crazy, as a crank fiddling about with wheats on pocket handkerchief plots—it is also said that threats were made to set fire to his plots. Later in connection with his extensive "Rust in Wheat" investigations when he sought the co-operation of selected farmers in carrying out carefully planned variety and strain trials he met with a certain amount of inertia and indifference.

Even after his death in 1906 there did not seem to be enthusiastic appreciation of his great work. An appeal for funds to commemorate his memory by the establishment of research scholarships was responded to with contributions totalling a little over £1,000.

When the Department of Agriculture was formed in 1891 steps were taken for the immediate appointment of a number of "inspectors"—the Director stated in the annual report in 1892: "Whatever the reasons may be, the idea has not found favour with the practical farmers of New South Wales". Perhaps the title "inspector" was ill-chosen but, it was not until the 1920's that it was altered to "instructor" and more recently to "extension officer", or more specifically "agronomist", "livestock officer", "fruit officer".

An outstanding and perhaps the most helpful development in agriculture during the last quarter century or so has been the change in attitude of the average farmer towards agricultural education. This was accelerated by the wider contacts and close co-operation between extension officers and farmers during World War II.

The farmer now recognises the agricultural scientist as a normal individual with a reasonable amount of practical knowledge and on the other hand the agricultural scientist knows the farmer as a reasonably intelligent being. Departmental officers are now unable to keep pace with the demands of farmers for information and advice.

While industrial firms in secondary industries are able to find finance to establish their own research branches, agricultural research is almost wholly a function of the state—this is so mainly owing to the small scale nature of the individual farmer's business. Farmers can, and do, through their industry organisations such as the Australian Wool Board, Australian Meat Board, Australian Dairy Council and the Milk Board, play a very important part in providing some finance to solve their problems. (It is interesting to note that wheat farmers, arising out of lively controversy, are taking steps for similar action.) Other institutions such as the Commonwealth Bank, the Rural Bank of N.S.W. and the trading banks also make generous contributions towards the cost of financing agricultural research projects. In it all we must not overlook the fact that individuals have at times made outstanding contributions through their own researches.

Farrer himself carried out most of his investigations privately before accepting in 1898 a position in the Department of Agriculture.

Efficiency in Farming

The Rural Reconstruction Commission (1945) repeatedly draws attention in its reports to the necessity for efficiency in farming.

In the Commonwealth Government's "Agriculture Production Aims and Policy" (1952) it was pointed out that while the population of Australia had increased from 1939 to 1952 at a rate of 2 per cent. per annum, agricultural production had increased by only 1 per cent. per annum.

Campbell (The Conditions of Increased Productivity in Agriculture. Jour. A.I.A.S. 19, 1953) comments: "These facts suggest that in the past fifteen years, advances in biological and engineering sciences have not been incorporated in Australian farming practice at the customary rate, or at the rate attained by other countries in a comparable state of agricultural development. The relatively slow rate of rise in productivity should be disquieting for anyone connected with agricultural research and extension in Australia."

Efficiency may be measured in various ways—output of food per acre; output per man; yield per acre, per cow, per hen; cost per unit; labour income—but from the farmer's point of view efficiency is synonymous with maximum profit.

Breeding for disease resistance is an important part of research.

Here Dr. F. C. Butler, Plant Pathologist at the New South Wales Agricultural Institute, examines wheat in the glasshouse.

The profitableness of the farm business depends on ample production, minimum costs of production and adequate prices. Ample production at minimum cost obviously depends on efficiency. The farmer probably thinks more of the gross prices realised for his products and of his consequent deposits in the bank, but under "price guarantees" and other "incentives" to ensure a "fair return" and stability of income to the producer, the consuming public, here and abroad, has a right to be critical and to demand that these prices should be based on the assumption that a reasonably high degree of skill and efficiency, using up-to-date methods and equipment, should accompany the production.

There are farmers and farmers! They are of all kinds and of all ranges of competency. Some idea of just how great these "ranges" are may be gathered from the official surveys made from time to time in various branches of the agricultural industry, including wheat (see Fig. 2), dairy (see Figs. 3 and 5), poultry (see Fig. 4) and fruit.

The Royal Commission on the Wheat, Flour and Bread Industries in its Second Report (1935) gives the range of No. 2 Costs for Australia as follows:

Lowest 20 per cent., 1s. 1d. to 2s. 9d.; second 20 per cent., 2s. 9d. to 3s. 3d.; middle 20 per cent., 3s. to 3d. to 3s. 10d.; fourth 20 per cent., 3s. 10d. to 4s. 8d.; highest 20 per cent., 4s. 8d. to 19s. 11d. per bushel. (For forty-nine farms in the Riverina the costs ranged from 1s. 10d. to 7s. 9d. per bushel.)

The Joint Dairying Industry Advisory Committee (1947—cf. Fig. 3) found that costs of production per pound of butter varied from 9d. to 8s. 6d. per lb. (Of 1,000 farms surveyed, 583 were in the 1s. 6d. to 2s. 6d. group, 79 below 1s. 6d., and 338 above 2s. 6d. per lb.)

The survey of costs of production of eggs (1949—cf. Fig. 4) gave a range of costs of 12 pence to 48 pence per dozen, about 50 per cent. being in the 2s. to 3s. group, about 35 per cent. below 2s. and 15 per cent. above 3s.; feed costs ranged from 7.24 pence to 33.26 pence per dozen and labour costs from 4d. to 43d.; the average lay per bird ranged from six dozen to sixteen dozen—about 22 per cent. were in the ten dozen groups, 38 per cent. below ten dozen and 40 per cent. above ten dozen.

In the case of Dried Vine Fruits (129 farms in 1950) costs ranged from £30 per

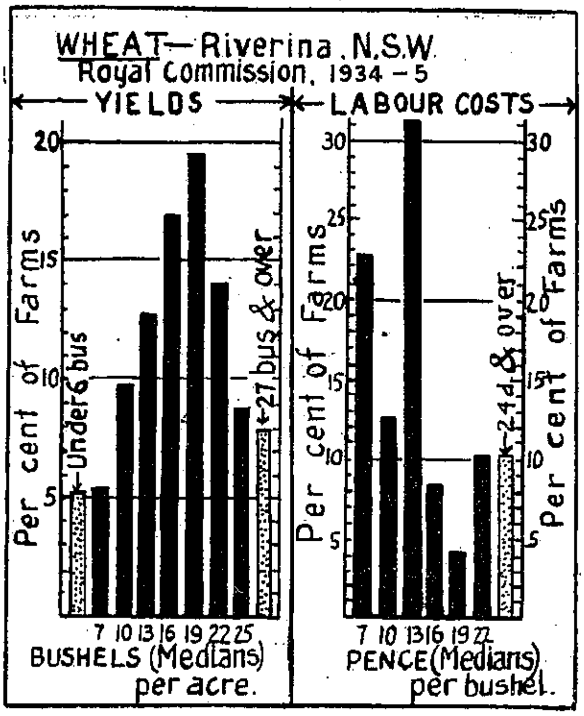


Fig. 2.

ton to £89 per ton—about 25 per cent. were in the £65 group, about 50 per cent. below this figure and 25 per cent. above it.

A survey of 107 farms in the Sydney milk zone in 1946-47 gave a range of costs of from 6d. to over 60d. per gallon! About 50 per cent. of the farms produced their milk at from 1s. 7½d. to 2s. 1d. per gallon, about 18 per cent. being above and 32 per cent. below these figures.

The Brisbane Milk Board in its survey of 135 farms in 1943 (cf. Fig. 5) gave a range of production from 270 to 636 gallons per cow (average 436) and average costs of Group 1 (10 farms), 9.56; Group 2 (52 farms), 15.36; Group 3 (54 farms), 23.73; Group 4 (19 farms), 34.64 pence per gallon.

One finds similar examples in the records of our N.S.W. herd testing schemes. For example in an M.I.A. unit (25 farms) one herd consisting of 87 cows had an average production of 95 lb. butter fat with no cow producing over 200 lb., while another farm with a herd of 20 cows had an average production of 257 lb. butter fat with only three cows producing less than 200 lb.

A report from Lismore (1933) stated that cows which do not produce 200 lb. butter fat are regarded as unprofitable—84.3 per cent. of the cows submitted to test in the Richmond River district produced less than 200 lb. butter fat.

Farmers' experiment plots and Royal Agricultural Society field competitions provide further evidence of the fact that there is a wide gap between the best farms and those that are in the "average" category—also between the "average" and the "worst" farms. It might be said with some degree of truth that if all the farms were as good as the best 15 per cent., production would go up by 50 per cent. Some farmers react responsively to recommendations for changes of technique, others, for some reason, or other, do not. The report of the Committee

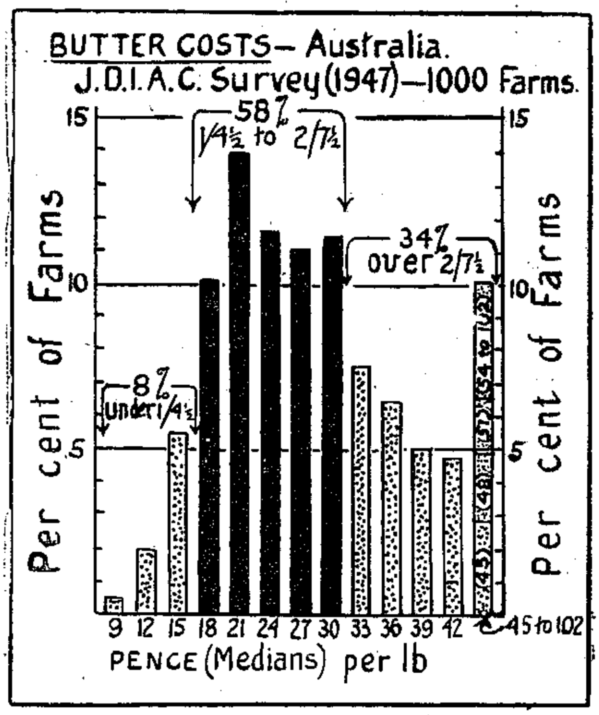


Fig. 3.

on Agricultural Education in Western Australia (1950) stated that "the Committee had abundant evidence that many farmers in Western Australia are not availing themselves of existing knowledge".

Schapper, of Western Australia, also comments (Jour. A.I.A.S. Sept. 1953) ". . . an important reason for low productivity and low income of many farmers is inadequate knowledge. Few read books of any sort, 55 per cent. did not get the free journal of the Department of Agriculture."

use of the "demonstration farm" method by the New South Wales Department of Agriculture under the Commonwealth Dairy Grant Scheme. On one demonstration farm the returns for 1949-50 exceeded those of the previous year by 2,267 lb. commercial butter (worth about £340) as a result of the introduction of the correct use of concentrates for supplementary feeding of dairy cows.

In another case (Cf. "Ag. Gaz." Nov. 1952) in three years commercial butter pro-

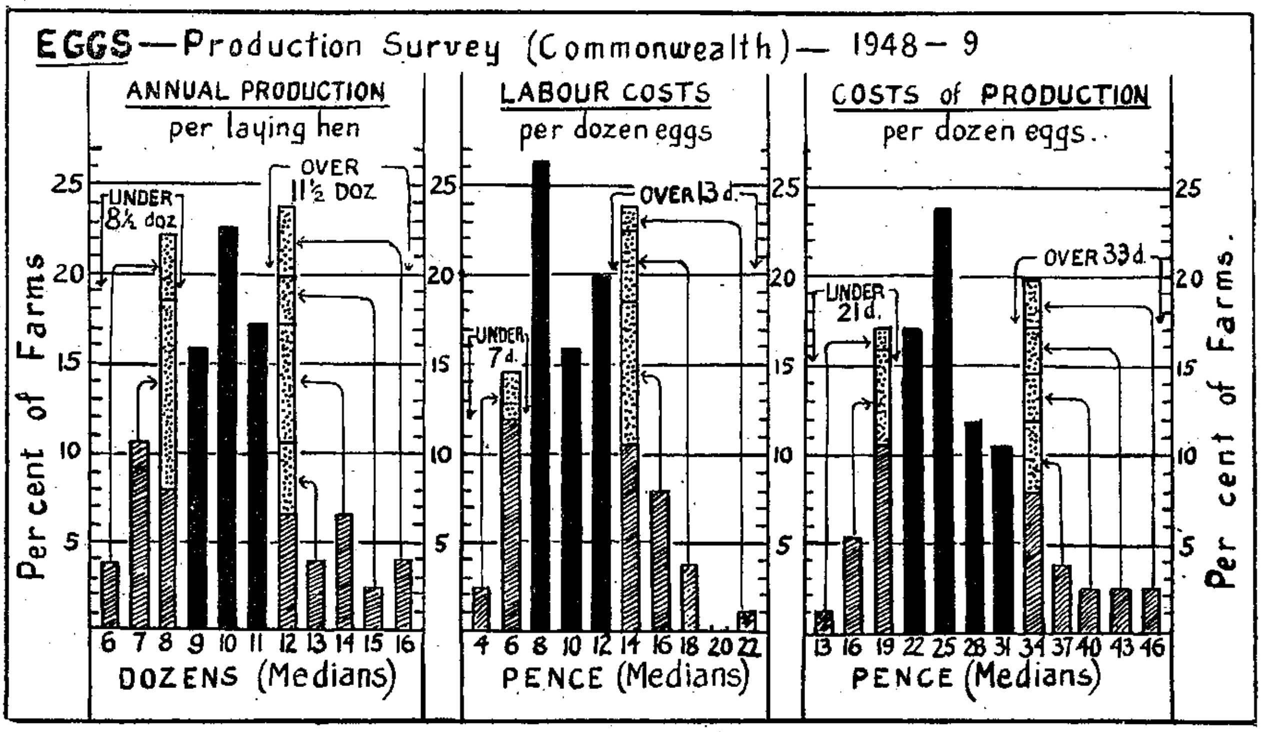


Fig. 4.

Dillon (Rev. Mktg. and Ag. Ec. Dec. 1954) found that 20 per cent. of family farms in the Richmond-Tweed region did not receive any agricultural newspapers or periodicals—on non-family farms the percentage was 52.

That the returns of individual farmers can be increased as a result of following technical advice has been exemplified in the

duction was increased by 7,898 lb., while in the Tamworth district (Cf. "Ag. Gaz." April 1955) the establishment of improved irrigated pastures with rotational electric fence grazing gave an increase of 43 lb. commercial butter per cow.

What the application of improved techniques can mean in £ s. d. to Australian farmers might be gauged from the following. An increase of:—

1 lb. of butter fat per cow (say 3m. cows at 3s. per lb.), £450,000.

1 bushel of wheat per acre (say 12m. acres at 10s. per bushel), £6,000,000.

¼ lb. of wool per sheep (say 100m. sheep at 5s. per lb.), £6,250,000.

A saving of only 1 per cent. in the costs of production would, in a similar manner, keep in the pockets of farmers, in the case of—

Butter (166,000 tons at 3s. per lb.), £550,000.

Wheat (160m. bushels at 10s.), £800,000.

Wool (1,000m. lb. at 5s.), £2,500,000.

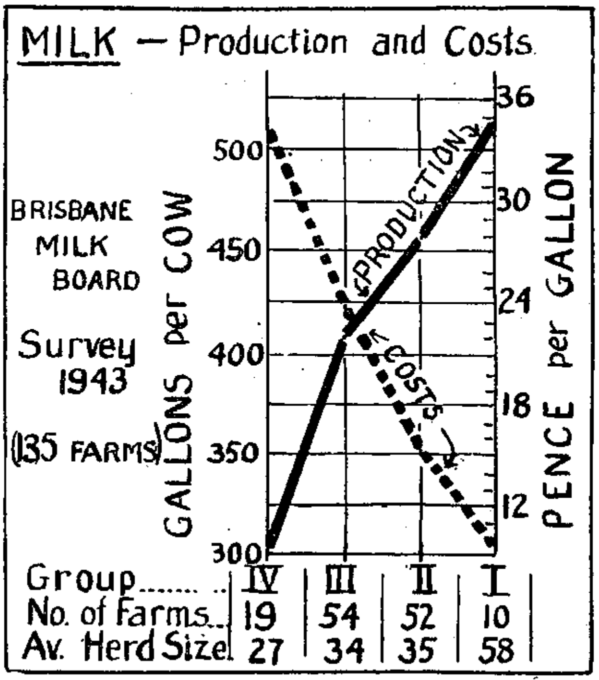


Fig. 5.

THE FUTURE:

TO-DAY'S KNOWLEDGE THE BASIS OF TO-MORROW'S PROSPERITY.

The knowledge that we have already is far in advance of the practice of it. The wide gap between the proven and approved findings of research and their general use in agricultural practice has still to be bridged.

Whether we like it or not, while it is obvious that more extensive application of existing knowledge is essential, science will continue to be applied with a will to farming. It is remarkable that in spite of all the centuries behind the practice of agriculture, we still have things to find out and the more we know, the more there is to know!

Already atomic energy is being used considerably in the form of radio-isotopes to help solve problems of photosynthesis and plant growth, plant and animal nutrition and plant and animal genetics.

Earlier this year Dr. John Hammond, a world authority on animal production, predicted that the use of atomic energy for the drying of grass, might, in fifty years' time, completely supersede hay and silage making.

Recent reports from U.S.A. indicate that the new antibiotic drugs, which are widely in use to cure the ills of livestock, may eventually have an even broader use in defeating the diseases of plants.

It seems inevitable that techniques—even systems of farming—will change more in the years to come and with far-reaching effects on our national economy and more particularly on our rural society—not only in the economic sense but also in the sociological (social, cultural, recreational) aspects of farm life. The farmer must be equipped to realise the importance and the significance of change and progress and attuned to be receptive of new ideas so that he may, with a minimum amount of guidance from without, accept responsibility for the efficient use of the factors of production—land, capital, labour—placed in his hands.

The Commonwealth Government realising that to attain the objectives in the plan for increased agricultural production it was essential to expand considerably the agricultural advisory (extension) services of the States, has made available an annual grant of £200,000 in addition to the Dairy Extension Grant of £250,000 a year.

From the national point of view, there can be no wiser investment than in agricultural education—resident instruction, research, extension. The nation has given the agricultural industry the free service of a considerable number of well-trained men experienced in all these branches—it is a national duty on the part of the farming community to make full use of these free services.

William Farrer's emphatic attitude towards the rôle of research and extension was expressed in his published writings—it may be gauged from the titles of two papers read by him before meetings of the Australasian Association for the Advancement of Science in 1900 and 1902 respectively:

In 1900: "How experiment farms can be made to help on in the best manner the agriculture of the Colony."

In 1902: "The absolute dependence of agricultural progress upon experiments, and suggestions in regard to some directions in which experimental work should be done for the agriculture of Australia."

May I conclude with the words, written in the N.S.W. "Agricultural Gazette" by F. B. Guthrie, who had been closely associated with Farrer, particularly in connection with the "milling quality" of wheats, and who was afterwards (in 1911) made an original member of the Farrer Memorial Trust:

"It behoves us as a community to see to it that the good work begun by Farrer should be continued in the spirit in which he conducted it."

Erratum: On page 6, column 1, line 8, for "repletion" read "depletion".

Sydney: A. H. Pettifer, Government Printer—1956.