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SOME BENEFACTORS OF AUSTRALIAN AGRICULTURE*

by

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There are still a few critics who complain about the slow rate of progress in the development of this island continent. Their pessimistic statements are hardly justified, as far as the primary industries are concerned, when we consider the striking contrast between the conditions of the first settlement and the position of present-day agriculture. A hundred and fifty years ago a handful of convicts, plying their hoes and sickles amongst the tree stumps in the neighbourhood of Parramatta and Windsor, were unable to supply the food requirements of a few thousand people. Nowadays thousands of prosperous farmers, using the most up-to-date machinery, cultivation and fertilizing methods, are not only feeding about eight million inhabitants of the Commonwealth but are also providing surpluses which place Australia among the world's major exporters of agricultural products. Australia is now the third most important exporter of wheat and is also making important contributions to the world's supply of sugar, fresh, canned and dried fruits, wines and other direct and indirect products of the soil—all this apart from the equally spectacular progress of the pastoral and dairying industries.

The main credit for all this is due to successive generations of the actual cultivators of the soil. But their tasks have been made easier, and their exertions more profitable, by a number of men who, by their enterprise, vision and devotion to research, have made valuable discoveries and opened up new avenues of progress. It is fitting that, from time to time, we should recall their achievements, and acknowledge our indebtedness to them.

The First Settlers.

The original efforts at agriculture here were carried out by convicts working under government direction, first at Farm Cove, where the Botanic Gardens now stand, later at Parramatta, and then on the Hawkesbury Flats nearby. With unskilled and rather unwilling labour in an unfamiliar environment, it was not surprising that the first harvest was a failure, that the second supplied little more than enough seed for the following year, and that the little community was continually on the verge of starvation.

Governor Phillip had, however, been given instructions to make free grants of land to convicts as soon as their sentences were completed. The first man to take advantage of this was James Ruse, who deserves a place on our list of benefactors as the first settler in Australia. He made quite a success of growing wheat, maize and vegetables, in spite of the very primitive implements with which he was supplied. By proving that it was possible for a man, with a minimum of assistance, to

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support himself on the land, he conferred a great benefit on the young community. Phillip, in 1792, had received further instructions from the British Government to give larger free grants of land to military, naval and civilian officers. These men were inclined to hold back till they had seen someone make a success of farming on his own account. Ruse made a success of it and showed the way. Many followed his example, with the result that agricultural progress was greatly accelerated, and the danger of famine diminished.

Of all the officers who took up land in the early days by far the most capable, energetic and successful was a rather impetuous young lieutenant of the New South Wales Corps, named John Macarthur. He, like Ruse, had the advantage of some farming experience in England, but his success was due mainly to the enterprise, vigour and efficiency he displayed in his agricultural pursuits. At Elizabeth Farm, Parramatta, he used the plough for the first time in Australia. Within three years he had 120 acres under wheat, and quite a considerable area under maize, potatoes and other vegetables, as well as fruit trees and vines. It is well known that Macarthur was the founder of the fine-wool industry in Australia, but it is not so generally known that he was also the real pioneer of the agricultural and mixed-farming industry as well.

Among the military officers, Captain William Cox was perhaps second in importance to Macarthur in his influence on early agriculture. On his first property at Brush Farm near Ryde, and later at Clarendon near Richmond, Cox made important contributions to the food supply and to agricultural progress generally. Of the civilian officers who devoted part of their energies to agriculture, Rev. Samuel Marsden, of Parramatta, was by far the most enterprising and successful. Before he became more famous as a stock-breeder, he, with the aid of the convicts assigned to him, had the greater part of his property at Dundas under crops of various kinds. Worthy of mention, too, are John and Gregory Blaxland, who were the first free settlers with capital to arrive in this country. They introduced improved agricultural implements and experimented with a variety of crops like flax, hemp, pasture plants and grapes for wine-making. It was men like these, rather than the emancipists, who saved the small community round Sydney and Parramatta from starvation. Although in later years they all devoted the bulk of their attention to the more profitable live-stock industries, they laid the foundation for later agricultural progress.

The Explorers.

It would be unfair to omit from the list of benefactors the name of Lachlan Macquarie, as he was the first among the early governors to envisage Australia as an important part of the British Empire, with latent land and mineral resources to be developed, and not just a "prison camp." He did everything he could to encourage exploration. It was during his administration that Blaxland, Lawson and Wentworth found a passage over the Blue Mountains, which some previous governors had regarded as a useful prison wall. He commissioned Surveyor Evans to follow their track and to extend his explorations into the country beyond the mountains. Evans penetrated as far as Bathurst and brought back a very favourable report on the country he had traversed, with the result that the whole outlook and prospects of the young colony were transformed.

Time will only permit of brief reference to that noble band of explorers who subsequently discovered new country suitable for settlement. Oxley and Allan Cunningham, Hume and Hovell, Rous, Sturt and Mitchell, amongst them, increased our knowledge of New South Wales, penetrating as far west as the Darling River, sailing down the Murray almost to the present site of Adelaide, and opening up substantial parts of the vast region which lies between Brisbane and Melbourne.

The Henty Brothers and John Batman did the pioneering exploring work in Victoria. They were to be followed later by Major Mitchell from New South Wales, and by Macdonald and Strezlecki, who discovered the heavily-timbered and well-watered district of Gippsland. It was from Melbourne, too, that the ill-fated Burke and Wills expedition started out. Mitchell, Leichhardt and Kennedy in Queensland, Edward John Eyre, Gregory and McDouall Stewart in South Australia and the Northern Territory, and Stirling, Eyre, Lefroy, John and Alexander Forrest, the Jardine Brothers, Giles and Baron von Mueller in West Australia, made very important additions to our knowledge of the other colonies.

Too great a tribute can hardly be paid to them, and to others of little less importance, as they ventured forth in the interior, not knowing what lay ahead of them, enduring privation and loneliness, crossing rivers, mountain ranges and deserts, with the ever-present danger of experiencing hunger and thirst and encountering attacks by hostile aborigines. Sometimes they lost their lives but left their records behind them, in order that they might pave the way for pastoral and agricultural settlement.

Mechanical Harvesting of Wheat.

As population grew, with the consequent need for greatly increased food supplies, the rapid development of the sheep and cattle industries was able to cope reasonably well with the mutton, beef, milk and butter requirements. However, the primitive methods of growing, and especially of harvesting, wheat set a definite limit to the production of that staple foodstuff.

Until 1843, wheat was still cut with the sickle or the scythe, bound into sheaves by hand, stooked, stacked, and afterwards threshed with the flail, although mechanical winnowers and sieves had gradually replaced the separation of the grain from the chaff by the winds of heaven. In that year, John Ridley, an Adelaide miller, constructed a machine known as the "stripper," which could harvest the ripe heads at the rate of ten acres per day while leaving the straw behind. This invention brought about quite a revolution in the industry. Indeed, it started the era of large-scale wheat-growing, for which Australia, by virtue of its economic and climatic conditions was particularly well-adapted.

Dr. G. W. Sutton, of Western Australia, who has made a very careful analysis of all the available evidence, regards Mr. J. W. Bull of Mount Gambier as the real inventor of the stripper, although he fully acknowledges Ridley's very important role in producing the first practical machine. It is quite true that Bull exhibited on 17th September, 1843, a sketch of a machine which contained the main principles of the stripper—the projecting comb and the revolving beaters—and that Ridley saw it on that date.

But knowing the difficulties and set-backs invariably encountered by inventors and constructors of new machines, I think it highly improbable that Ridley could have produced a stripper which did its work perfectly only eight weeks after seeing the sketch. It seems to me much more likely that he had been working on the same idea for many months in advance. Moreover, it is difficult to imagine a man of Ridley's high character failing to acknowledge his indebtedness to Bull, if he really got his main idea from him. In any case, it was Ridley who actually produced the first stripper and there is ample evidence that it was a complete success at the first demonstration of the improved machine, on 14th November, 1843. F. S. Dutton, in his *Early Days in South Australia,* described it thus:

> The heads of the wheat were threshed off perfectly clean and, a winnowing machine being at hand, the wheat was transferred out of the reaper into the latter machine, and carts were ready to convey the cleaned wheat to the mill, two miles off, where the wheat, which an hour before was waving in the fields in all the lustre of golden tints, was by Ridley's steam-engine ground into flour.

It is also on record that, at this first public trial, seventy acres of wheat were reaped and threshed in seven days.

Ridley could have made a large fortune out of his invention, but he refused to take out a patent so that the farming community could have the full benefit from it straightaway. Several firms were soon manufacturing it on quite a large scale. Its use spread slowly to the other wheat-growing colonies and it became the usual method of harvesting wheat in Australia, for several decades.

Building on Ridley's idea, Mr. H. V. Mackay, forty-one years later, produced the "combined harvester," which completed the stripping and threshing of the grain in one operation, so that only two men, instead of four, were normally required on the harvest field. (This machine has now largely been superseded by the header or reaper-thresher, frequently tractor-drawn, or with a tractor combined with the header in one machine, the auto-header.) The evolution of harvesting machinery suitable to their conditions by Australians themselves, starting with Ridley's stripper, has been a very important factor in enabling the Commonwealth to compete successfully in the world's markets. It is every bit as creditable as the parallel developments of harvesting machinery in Europe and America.

The Stump-jump Plough.

Another mechanical invention, which greatly speeded up the progress of the agricultural industry, was also developed in South Australia. Whatever the nature of the forest covering, it is a difficult task to get the land completely clear of roots and stumps. Consequently the ordinary set plough cannot be used satisfactorily. This is particularly true of the mallee country, which forms quite a considerable proportion of the wheat-belt in South Australia, Victoria and Western Australia.

In 1876, Mr. R. B. Smith, of Ardrossan, South Australia, assisted by his brother, C. J. Smith, evolved the simple, but ingenious stump-jump plough which overcame the difficulty. This, together with the introduction of the mallee roller, enabled millions of acres to be brought under cultivation economically. This objective could not have been achieved without them.

Although his work was of greater importance to the pastoral and dairying industries, it is appropriate to mention the name of Thomas Sutcliffe Mort, who introduced the first successful commercial system of refrigeration. Mort and a skilled engineer, Mr. E. D. Nicolle, worked patiently and persistently on their project in a small factory in Darlinghurst for over seven years, Mort bearing all the expenses which were said to be in the vicinity of £100,000. The problem was to get a continuous temperature below freezing point for an indefinite period. They finally solved it by a mechanism, which enabled the evaporating ammonia to be used over and over again. There is no need to emphasise the incalculable benefit to humanity which this successful device, for the preservation and transport of perishable foodstuffs, has been. It was unfortunate that Mort passed away before the first successful cargo of frozen meat in any part of the world was on its way to London from Sydney.

Irrigation Developments.

In 1886 two young Canadians, George and W. B. Chaffey, arrived in Victoria to start the first irrigation project in Australia at Mildura, and the second a little later at Renmark, South Australia. They had already established two very successful irrigation settlements in California, and had every reason to expect the continuance of a prosperous career in America. They were probably induced to engage in their new venture across the Pacific by the persuasive eloquence of Alfred Deakin, by the over-enthusiastic reports from their agent, Mr. Cureton, and by their desire to be again citizens of the British Empire.

Australia was fortunate in gaining such immigrants. The Chaffey brothers possessed between them a unique combination of engineering knowledge, irrigation and horticultural experience, courage, resourcefulness and practical business ability, which enabled them to overcome the enormous natural and man-made difficulties which confronted them. It is very doubtful, indeed, whether any man or group of men in the whole world could have accomplished what these brothers did.

George Chaffey, the elder of the two, sailed up the Murray and selected old Mildura station as the site for the proposed settlement. This was situated in mallee country near the north-western corner of Victoria with an unreliable annual rainfall averaging about 12 inches. It had never been a success as a pastoral property, in spite of the low rental of 1d. for 14 acres, as its normal carrying capacity was about 1 sheep to 20 acres. At the time of George Chaffey's visit, the carrying capacity had declined almost to nothing, following a series of drought years and an invasion of rabbits. Moreover, the water had to be pumped from the Murray to a height of nearly 100 feet so as to command the portion of the land it was proposed to irrigate. Nowhere else in the world was there in existence a scheme for irrigating thousands of acres at a height several times that of the greatest lift possible by the pumps then known. Then, too, Mildura was 150 miles from the nearest railway, and was dependent for transport on a rather primitive and irregular steamer service on the Murray.

The Chaffeys had to provide all the capital, install all the plant, clear and grade the land, get rid of the rabbits, construct all the irrigation channels, and wait for some years before they could expect any return from the sale of the improved land. One would have thought that the Victorian Government would have been eager to help them in every

possible way, but many obstacles were placed in their path. They, however, triumphed over all these early difficulties. George Chaffey installed a new type of pumping plant of his own design to supplement the earlier improvised pumps. The new plant took the great British firm of Tangyes three years to make and deliver. Settlement actually began in 1888. Two years later Mildura had a population of 3,000, including 950 resident settlers with their families. Six thousand five hundred acres had been cleared, 4,500 acres were under cultivation, and 900 acres had been planted with vines and fruit trees, all in a flourishing condition as the result of the application of water to this "worn-out sheep run." By 1903 (thirteen years later), the production from the irrigated land was worth £580,000.

Long before this, the Chaffeys themselves had been practically ruined by the depression of the 'nineties, the machinations of their enemies and unsympathetic treatment by the Victorian Government. Since then, Mildura and its off-shoots—Merbein and Red Cliffs, as well as Renmark and its satellites—have gone ahead by leaps and bounds, keeping pace with other irrigation projects where the water is supplied by gravitation instead of by the much more expensive method of pumping. The work of the Chaffey brothers in proving the practicability of irrigation at Mildura and Renmark has been of immense importance to Australia. It paved the way for that ever-expanding chain of irrigation settlements which have added so much to the value of rural production, and to the happiness and well-being of thousands of producers in closely-settled communities which possess many of the social advantages and amenities which are denied to more scattered populations.

Two Later Benefactors.

Nearly all of these improvements and advances took place before any of the states (or colonies as they then were) started to play a systematic part in solving the problems of the rural industries by starting departments of agriculture and agricultural colleges, and long before the universities established schools of agriculture or the C.S.I.R. (with or without the "O.") initiated its programme of research. Extra credit should, therefore, be given to the few men who, by their vision, genius and enterprise, and usually without any personal gain to themselves, contributed so much to the progress of Australia. Since then the number of research workers in agriculture have increased very greatly and the benefactors have become much more numerous. However, I must leave it to future historians to tell the story of their achievements. I must content myself with some account of two of the greatest benefactors of Australian agriculture brought to light by government action—William Lowrie and William Farrer.

Largely as the result of the work of Ridley and Smith, South Australia developed into the leading agricultural colony, and exported wheat to all the others except Victoria. But in spite of the improved devices, the yield of wheat in South Australia rapidly declined until for a whole decade it actually averaged less than five bushels per acre. One reason for this was that weeds became a serious pest on land kept almost continuously under wheat. A few progressive farmers occasionally cultivated their land, without a crop, for nine months or so before seedtime, with the object of getting rid of weeds and thus improving their yields.

This practice of the cultivated fallow helped matters considerably, but it was obvious that something else must be wrong—probably a soil deficiency of some sort.

The South Australian Government therefore resolved that it was time to appoint a professor of agriculture, and to establish an agricultural college or experiment farm, where field trials with artificial fertilizers, amongst other things, could be carried out. Professor Custance was appointed Director of Agriculture and first Principal of Roseworthy Agricultural College. He designed a series of field fertilizer trials after the manner of those conducted at the historic research station at Rothamsted, England. Now, as is well-known, the three main ingredients in fertilizers are nitrogen, potash and phosphates. The soil at Roseworthy showed no response to potash, very little to nitrogen, but a very marked response to phosphates, especially the most soluble form occurring in superphosphates.

The Work of Professor Lowrie in South Australia.

Professor Custance did not stay very long and was succeeded in 1887 by Professor William Lowrie, a graduate in agricultural science of the University of Edinburgh. He repeated and extended Custance's experiments at Roseworthy and on a number of private farms. These convinced him that it would be profitable to apply superphosphate to typical wheat land in South Australia at the rate of 1 to 2 cwt. per acre.

He carried out a vigorous campaign amongst farmers to get them to adopt the practice. Some heeded his advice and profited by it to the extent of at least £1 per acre, whilst others at first were inclined to be sceptical. Lowrie's own experiments at Roseworthy over a series of years resulted in an increase of seven bushels through the application of 1 cwt. of superphosphate. In other parts of the colony the effects were greater. In some of the mallee districts, indeed, it was impossible to get a crop of any kind without it. The practice of applying superphosphate spread to the other colonies and made rapid headway until now there is scarcely an acre of wheat sown in South Australia, Western Australia, Victoria or the southern three-quarters of New South Wales without a dressing of this fertilizer. Indeed, in some districts in the southern states, the farmers would as soon think of leaving out the seed as of leaving out the superphosphate.

Lowrie also looked carefully into the question of the cultivated fallow, pointing out that, in addition to destroying weeds, it conserved moisture in the soil and subsoil and encouraged the bacterial processes which render the nitrogenous constituents of the soil available to crops. He emphasised that if moisture was to be conserved, under the climatic conditions of South Australia, with its winter and spring rainfall and long summer drought, fallowing had to be started early. As the rainfall is the most frequent limiting factor in the growth of wheat throughout a large part of the Commonwealth, it is a matter of the greatest importance to have a reserve of moisture in the soil at seeding time. The adoption of the practice of the cultivated fallow in the wheat belt of Australia has been almost as important as the introduction of superphosphate. The general adoption of the two practices doubled the average yield of wheat in South Australia in a short time, and has made wheat-growing more secure and remunerative in all the southern states.

Lowrie was careful to warn the farmers against the practice of continuous cropping (or even fallow alternating with one or two cereal crops), because of the danger of depleting the organic matter and humus in the soil—a warning which, unfortunately, was too frequently neglected. He was a great advocate of the combination of sheep (especially fat-lamb raising) with wheat and of having at least one year in three devoted to pasture.

Incidentally, the residual effect of the superphosphate applied to the wheat greatly benefited the so-called pasture, which consisted mainly of self-sown wheat and oats, and annual grasses and legumes like the trefoils. Professor Lowrie thus made important contributions to all except two of the factors which have been responsible for the success of the wheat-growing industry in recent years—superphosphate, early fallowing, rotation of crops and the combination of sheep with wheat. The other two, mechanical labour-saving devices and the breeding of new varieties, were rather outside his sphere. He therefore merits a very high place indeed amongst the benefactors of the agricultural industry.

William Farrer.

In spite of the rapid progress made as a result of the discoveries just enumerated between the 'forties and 'nineties of last century, there was one serious drawback to the progress of wheat-growing. The varieties of wheat grown in this country were mainly imported from the United Kingdom and South Africa, and none of them was anything like ideal for Australian conditions. This brought into the field one of the greatest, if not the greatest, benefactor of them all, William Farrer, the man whom we particularly honour on this occasion.

Farrer was born in 1845, the son of a landed proprietor in the County of Westmoreland in the north-west of England—a county more noted for its scenery than for the fertility of the soil. His people must have been reasonably well-off, as he was educated at a good school, from which he proceeded to Cambridge University, where he graduated Bachelor of Arts, in 1868, gaining special distinction in mathematics. He then started to study medicine; but his own health broke down and he developed lung trouble. It was thought that a drier, warmer climate would suit him better; so, fortunately for us, he came to Australia in 1870 at the age of 25. It seems to have been his ultimate intention to take up a grazing property. As a partial preparation for that, he took the position of tutor to the family of Mr. George Campbell, of Duntroon Station, near Canberra. For the next five years he spent his time in various capacities at this and other pastoral properties. The loss of some of his capital in mining speculations robbed him of the opportunity of acquiring a place of his own. In 1875 he qualified as a surveyor, and, for the next eleven years, did survey work for the Lands Department, first at Dubbo, then between Nyngan and Cobar and later in the Cooma district. In 1882 he married the daughter of Mr. Fane de Salis, of Cuppacumbalong Station, in what is now the Australian Capital Territory.

His Work at Lambrigg.

Four years later Cuppacumbalong Station was sold, and Farrer retired to a small property at Lambrigg, which was either an off-shoot of, or a selection from, Cuppacumbalong.

Farrer kept a few livestock and established an attractive garden. However, his main interest at Lambrigg centred round a three-acre paddock, where he started to collect a great variety of wheats from the other colonies, and also from Canada, the United States and India, especially those which had a reputation for rust resistance.

For the first three years he confined himself to close observation of the varieties and a certain amount of selection work. He soon came to the conclusion that some new method was necessary if he were to reach his objective of producing new varieties more suitable to the Australian environment. He decided on cross-breeding followed by selection, so that he could combine the good qualities of two or more varieties in one variety, and "fix" these desirable qualities, so that the new varieties would always breed true to them. Farrer was the first wheat-breeder in Australia, and almost the first in the world to adopt this method, which has since given such fruitful results in every progressive wheat-growing country.

He actually made his first cross in this little three-acre paddock at Lambrigg in 1889 and it was not till eleven years later, in 1900, that his first cross-bred variety, Bobs, was released. In the meantime his work had attracted the attention of the recently-formed Department of Agriculture in New South Wales. In 1898 he was appointed Wheat Experimentalist to the Department at a salary of £350 per annum. What induced Farrer to accept the position was the much wider opportunity it gave him to develop his work in typical wheat-growing districts like Wagga, Bathurst and Cowra and the use of a greater area of land on which to test the yielding capacity of his new cross-breds, in comparison with the popular varieties then grown. For nine years at Lambrigg and eight years with the Department, he pursued his breeding programme with remarkable zeal, enthusiasm and persistence.

From the beginning of the century till the time of his death in 1906, he released, for extended trial, a number of new varieties each year; whilst others which were not properly fixed at the time of his death were made available later.

As I arrived in Australia four years after Farrer's death, I am indebted to others for a description of his personal qualities. The late F. B. Guthrie, who was a close friend as well as being very helpful to him on certain aspects of his investigations, particularly as regards baking quality, said of Farrer:

> He was very shy and reserved with strangers but, to those who knew him intimately, one of the most high-minded, generous and unassuming of men. . . . A fluent and ready writer and master of English prose . . . he possessed untiring enthusiasm and worked with remarkable energy. . . . He was simple and frugal in his personal habits . . . loved his work and left it unwillingly when darkness came.

That brief summing-up agrees with all I have heard of him from other sources.

Breeding for Rust Resistance.

Farrer was first attracted to wheat breeding by the desire to produce varieties which would resist rust, a fungous disease which almost threatened the continuance of the wheat-growing industry in the early 'nineties. According to some popular accounts of Farrer's work, the

breeding of rust-resistant wheats was his main achievement. I hope I will not be misunderstood when I say that that was the objective in which he was perhaps least successful. That is hardly to wondered at, however, in the light of subsequent investigations which have shown what a complex problem is involved in getting complete resistance to all the various forms of rust.

Farrer did, however, produce quite a number of varieties which were more rust-resistant than any of the older varieties. More important than that, he gave to Australia varieties which gave a higher yield per acre, were earlier in maturing, more drought-resistant, more bunt-resistant, stronger in the straw and of better milling and baking quality.

In increased yield alone his varieties added millions of pounds annually to the value of the Australian harvest for many years. But his work meant even more than that. By prolonging the sowing season, he made possible the extension of wheat-growing into drier areas, made the work of harvesting easier and appreciably raised the average quality of the grain for bread-making. He thus raised the whole wheat-growing industry to a higher plane.

Outstanding Varieties.

His most popular variety was undoubtedly Federation, which, as the name suggests, was released for general cultivation about 1901. By 1910, more than half the wheat area in New South Wales was sown with this variety and it was very popular indeed in all other states. It remained the most popular variety in New South Wales till 1935, after which it gradually declined in favour. Although the quality of the grain was little above the ordinary, and it had little resistance to rust, it was drought-resistant, had a high ratio of grain to straw, was easy to harvest, and, above all, it filled the bags more quickly than any other variety as the harvester went round the paddocks. It is not given to many men to alter the appearance of a whole landscape as Farrer did with this variety, owing to the dark-brown heads of Federation replacing the rather pale golden colour of the varieties which it supplanted.

Farrer continued to keep in touch with institutions and men engaged in cereal-breeding in other parts of the world, and with them he exchanged varieties. The parentage of Federation illustrates this as well as throwing light on Farrer's general methods.

He first of all crossed Improved Fife, a variety imported from Canada, particularly noted for the quality of the grain, with an Indian variety called Etawah, which was early in maturing, short in the straw, and had a reputation for drought resistance. The result of this cross was the variety Yandilla which proved a rather indifferent yielder although it had other good qualities. Farrer, therefore, crossed it with the best-yielding of the local purple-straw varieties he could find, and, after fixing one strain of the variable progeny of this second cross, got the variety Federation.

The benefit derived from the improved Farrer varieties was not confined to Australia. Some of them have been grown with success in nearly every country with similar climatic conditions—the United States, India, Argentina and some of the Mediterranean countries, especially Greece.

Two other wheat breeders who were contemporaries of Farrer and who, in close touch with him, produced a number of varieties which were widely grown, should be mentioned. These men were Marshall of South Australia, and Hugh Pye, a former Principal of Dookie Agricultural College in Victoria.

Very few Farrer varieties are grown to-day and none of them extensively. Why? Because they have been displaced by still better varieties, most of which have Farrer wheats in their parentage. They have been bred by men who have learned some of their technique and received a great deal of their inspiration from the pioneer wheat breeder of Australia.

Concluding Remarks.

At the beginning of my address, I spoke of the remarkable progress of the rural industries in a century and a half of British occupation. I should, however, qualify my eulogy by pointing out that the striking results have been achieved by a system of land utilization, which has on the whole been too much of the exploitative type, using up the capital of the soil with too little thought to its replenishment. This is almost a normal happening in a new country. It is essential that we realize that we must now push on vigorously to the second stage in agricultural evolution, which has been attained in Great Britain and some of the older agricultural countries, namely, a permanent system of agricultural development in which the maintenance of soil fertility, and of the soil itself, are the primary consideration. The exploitative, or mining, phase has already, in many districts, done irreparable damage in the various forms of soil erosion, to which our erratic climate renders us so vulnerable. One of the main tasks of the immediate future is to work out for every district and every set of conditions, the very best means of maintaining or increasing fertility, and preventing erosion, consistent with profitable production. The men who do that, and get the landholder to adopt the methods, will take a prominent place amongst the benefactors of the future.

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