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abundant evidence to show that the pasture lands, especially those in the districts of better rainfall, could be greatly increased in carrying capacity.

The Babcock Test.

The simple method formulated by Dr. Babcock, of the Wisconsin Experiment Station, to determine the fat content of milk and cream, has changed the outlook for the dairying industry. Not only has it enabled butter factories to use an exact method of payment for milk and cream according to the quality of the product, but it is of incalculable value in improvement of the dairy herds of the State. A new standard for breeding has been placed before dairymen, the breeding and feeding of cattle that will produce the highest quantity of butter fat per annum, and not merely the highest quantity of milk. The simple and rapid method of determining the butter-fat percentage of the milk provides the dairyman with a means of detecting unprofitable members of his herd, and enables him to build up a herd of efficient butter-fat manufacturers. The motto for the dairyman should be—Breed, feed, weed! Breed from the best types of cattle. Feed them well, for after all, the cow is in essence a milk factory transforming the raw material—food—into milk. Weed—that is ascertain the quantity of butter fat produced by each individual for the year, and cull out those below the standard. A firm scientific basis for herd testing has been provided by the discovery of the simple method of determining the fat content of milk.

Wheat Breeding.

Very important help has been placed in the hands of the plant breeder by the scientific work of Gregor Meidel, a monk in the Monastery of Brunn, in Austrian Silesia. Mendel experimented with the hydridizing of garden pease in the monastery garden, and discovered what is now known as Mendel's Law of Heredity. This law is now regarded as the greatest of all biological discoveries, and the knowledge of the working of the law is an invaluable help to the plant breeder. I must content myself at this stage to affirm that with a knowledge of Mendel's Law, the plant :breeder can breed plants to order. He can produce and create new varieties of wheat with the same certainty that the architect can conceive a new type of house, draw plans of it, and reproduce it faithfully in wood, stone, or brick. Farrer—that great painstaking and retiring genius of New South Wales—who laboured incessantly in the interests of wheatgrowers; the creator of Federation wheat, and a dozen other varieties—offers a fine illustration of what science can do for agriculture. He was a scientist of Cambridge University, and in 1901 produced his famous Federation wheat, a variety that is so popular in Victoria and New South Wales. In many parts of Victoria no other wheat is grown but Federation, and in the Wimmera—probably the premier wheat-producing district of the Commonwealth—more than 90 per cent. of the wheat is Federation. Its introduction into Victoria has meant at least £500,000 a year to the Victorian farmers for the past 15 years. So popular has Federation become, that Farrer may be said to have changed the colour of the harvest fields in Northern Victoria from golden yellow to dull bronze—the colour of his own Federation wheat.

Phylloxera.

Now consider the interesting part played b science in the viticultural industry. In 1863 phylloxera broke out in France. Within 20 years 2,500,000 acres of vines had been absolutely destroyed. The total damage done by this pest amounted to £400,000,000—twice the amount of the war indemnity paid by France in the Franco-Prussian War. It broke out in Geelong in 1877, and at Rutherglen in 1898, and destroyed 30,000 acres of vines in Victoria. This will give an idea of the disastrous effects of phylloxera. South Australia has never yet suffered from this terrible scourge. Let us hope she never will. The rigid regulations against the introduction of vines from other States may keep this pest away indefinitely. It may be explained that the phylloxera is an American insect found east of the Rocky Mountains. It lives on the leaves of American vines, and causes galls on the leaves. The French Government sent a scientific commission to America to study the pest on the spot. This commission systematically examined the whole problem, and came to the following conclusions:—(1) Phylloxera rarely attacked the leaves of European vines, though it completely destroyed the roots. (2) Phylloxera formed galls on the leaves of American vines but the roots were immune from attacks. (3) Therefore, if the European vines were grafted on to the roots of American vines, the resultant plants would be immune from attack. Much work had to be done to decide which varieties of vines would act as the best stocks. After considerable systematic experimental work, involving the testing of thousands of varieties, and new crossbreds produced by hybridization, one stock (Rupestris) was selected for propagation. With the aid of these phylloxera-resistant stocks the process of reconstitution of vineyards has been possible. Nearly 10,000 acres of such vines have been planted in Rutherglen, and they thrive and yield well in phylloxera infested soil.

Fungus and Insect Pests.

The plant pathologist and entomologist have rendered signal service to the farmer. They have worked out the life history of the various pests, discovered the weak points in the life history of these pests, and have specified methods of treatment which are effective. To take one example—smut in wheat. This has been known from the very earliest times. The early Latin writers on agriculture discuss it, and one of them, Calumella, went so far as to say that the only cure for it was to place boughs of laurel in the ground around the wheat crop, to draw off surplus water from the crop. A scientist named Kuehn in 1858 studied this fungus parasite in wheat, and found that it attacked the wheat just at the stage of germination, and that it penetrated the young seedling within a few days of germination. He therefore suggested dipping the seed in a solution of copper sulphate, or bluestone, to kill it, which process is very effective. In 1895 a scientist named Geuther first suggested the use of formalin for pickling wheat. The Australian wheat growers have extensively used both these methods, but within a few years it is probable that the whole world will be profiting by a discovery of one of our own scientists, Dr. Darnell Smith, of New South Wales, who first suggested the use of dry pickling with powdered copper carbonate. The great advantage of this

but a mode of life as well, and if it is to be successful in the latter it must afford its devotees the same comforts of life as are obtainable in other occupations. This has not hitherto been possible, but its realization is becoming every day more probable, for one of the distinctive developments of modern farming is the establishment of comforts and conveniences in the farm homes. The farmer has hitherto provided himself with all sorts of machinery and ingenious mechanical devices to cheapen production and make labour easier for himself, his hired help, and even his animals. In the meantime his wife gets on with no real conveniences and no comfortable home, living and scraping along for the day when the family shall build its home in town and 'have the conveniences." Many a man has turned his back upon the farm that made his wealth and stripped the land of its fertility to build in the town the home to which the farm was entitled. Farming and pioneering started off together, and the lot of the pioneer farmer was hard, not because he was a farmer, but because he was a pioneer. Nature was unsubdued, men and women were poor, and life indeed was hard when necessities were regarded as luxuries. But these days are over in real agricultural lands, and farming is coming into its own, but it will not come fully into its own until farmers learn to build comfortable houses for themselves and their children, and instal some of the conveniences that are regarded as essentials in every city home. That is what is meant by saying that the country must be comfortable. Finally, the men and women who live upon the land and who till the soil—it is really the nation's soil and not their's—should receive an education which will make them efficient in a business way, and which will make them good citizens as well.

Development a Public Question.

These then, are, as I see it, the main objects of agricultural education—the development of agriculture until it shall be fully profitable, productive, and permanent, until the country districts are comfortable and the rural people have adequate facilities for education. Now, if this development were merely the concern of the farmers, they might well be left to provide it for themselves. But in the final analysis, the development of agriculture is a public question. The farmers are interested, of course, but even if they were not interested, the State and the nation should still insist, for public reasons, that agriculture should be developed to the utmost. The farmers may reap the first advantage of such improvement, but they can realize no advantages that are not shared by the whole community. The development of agriculture is, therefore, a matter of vital public concern, and any money spent upon it is an investment in the safest bank on earth—the soil of the Commonwealth, and the people on whom the nation must depend for its management. And agriculture is enormously productive — every increase of only one bushel per acre in the wheat yield of Australia means, at present prices, an addition of £3,000,000 a year to the people of Australia. Every disease affecting farm crops, whether it be a fungus or insect pest, we learn to control, will mean the saving of millions per annum to the Commonwealth. Every contribution made to our knowledge of stock feeding and stock management is of great public benefit. Therefore, spending of public money on agricultural education, development, and research will ultimately be returned to the State many times over in the form of increased primary production.

method—which promises to displace all others within a few years—is that the farmer may pickle his seed before he sows it without any damage to his seed; and, moreover tests have shown that it is superior in every way to formalin and bluestone. Then we might mention a number of ways in which science has aided agriculture and horticulture by control of insects by spraying, fumigating, and poisoning. There are two cases relating to control of weevil in wheat which are worthy of notice. In 1918 Professor Maxwell Lefroy was engaged by the Imperial Government to visit Australia and study the weevil problem, which was causing so much damage to our wheat stacks. After careful investigation he suggested that by heating the weevily wheat to 140 deg. for a few minutes, both the weevil and their eggs were completely destroyed, but the wheat was not affected at all for breadmaking. The whole of the weevily wheat in Australia owned by the Imperial Government was treated on the scheme suggested, with the result that hundreds of thousands of pounds were saved. I might mention, too, that your own Dr. Hargraves, the Director of Chemistry, also devised an effective method of dealing with weevil in the wheat stacks. He found that the weevils were very sensitive to a mixture of carbonmonoxide and carbondioxide gas, and by enclosing the stack in malthoid and pumping in the exhaust gases from an engine, the weevil could be readily brought under control.

How Implements Have Helped.

I cannot allow this brief review to close without referring to the valuable services rendered to the wheat industry by the agricultural implement manufacturers, and in particular in the development of the Australian harvester. Less than a century ago it took a man and three horses to cut with sickle and thresh with flail one bushel of wheat. With the modern harvester a bushel of wheat can be reaped in less than three minutes. The modern stripper had its prototype in the Gallic header described by Pliny in 70 A.D. This consisted of a two-wheeled cart pusher through the crop by an animal yoked behind the cart. The heads were stripped off the standing crop by a series of lance-shaped knives, and the ears were raked into the body of the cart as it proceeded through the crop. Ridley, of South Australia, in 1845 produced the first successful stripper. He employed the principle of the Gallic machine, and removed the heads from the standing crop by means of a comb and a rapidly revolving beater. The harvester evolved next by an easy process from the stripper. It carried a winnower and performed the stripping and winnowing of the grain in one operation, delivering the cleaned grain into a large box. The modern harvester is the most efficient,economical, and labour-saving machine, and its introduction has greatly reduced the cost of labour in the harvest field, and has greatly extended the area that is possible for one man to deal with. Australia is one of the few countries where this machine can be used to advantage, and it is largely owing to this that our wheatgrowers—although 11,000 miles from their market—can compete with the rest of the world in economic wheat production.

The Object of Agricultural Education.

An efficient system of agricultural education is an absolute necessity for national progress. Money spent on agricultural education and development is a wise national investment, which is repaid to the nation and to the State many times over in the form of increased production. In every modern agricultural country large sums of money are annually appropriated for agricultural education. The expenditure by the United States exceeds £12,000,000 a year, and that by Canada and South Africa is as large in proportion to the population. Agricultural education and agricultural research receive large appropriations from Federal sources in each of these three countries. There is a general agreement as to the objective of agricultural education in these countries. The fundamental purpose of agricultural education is the development of agriculture as a productive occupation, and of the agricultural people as an important part of the social and political fabric. The object of agricultural education is the development of agriculture to its highest possible limit; both as a business and as a mode of life; the development of agriculture until it shall be profitable, productive, and permanent until the rural districts are comfortable and the rural people are educated. These are the specific aims of educationists in agriculture.

An Agriculture Profitable.

Agriculture must be made profitable, because farming is a business, and the first and fundamental step is to put it on a paying basis. The agricultural colleges and experiment stations have devoted their main efforts to increasing the profits from farming, and demonstrating how manures, new varieties of seed and various cultural practices will bring about better results. In the early days farming was not then capitalized industry, and failure was almost impossible. Land was cheap and plentiful, and it was very productive, because it had the fertility of ages stored within it. But the man who takes up farming to-day has to purchase land at three to ten times what it cost, say, 40 years ago, and he has to farm land, which has lost much of its fertility through improvident cropping. Farming now requires the outlay of much capital for purchase of land and costly equipment, and the man who engages in it will require at least as much training and ability as he who engages in business pursuits in the city. Failures will be relatively easy for the new discoveries of science, while they tend to establish the business on a sounder basis; do not make it easier for novices or men of low capacity. Moreover, the young farmer must fight against more destructive insects and fungoid pests than any generation of farmers preceding him, and new pests and noxious weeds are appearing every year. He has to face new problems in marketing and in farm management. The young farmer of to-day therefore finds in all these things a challenge to his ability and courage, and he must face these problems, not only with experience, but also with science as his ally, and his intelligence broadened by the best education. Agriculture, moreover, must be made productive, and must keep pace with the increasing population of the country and of the world. You will remember the celebrated doctrine of Malthus, who observed in his time—1798—that population tended to increase far more rapidly than the food supply, that population tended to increase in geometrical progression, while food supply increased only in arithmetical progression. Malthus therefore forecasted periodical famines for the peoples of the world because of the failure of food supply to keep pace with the growth of population. Happily, however, his gloomy prophecy has not been fulfilled. With the opening up of the prairies of America, Canada, and Argentina, and the wheatfields of Australia, new sources of food supply have been obtained. Moreover, throughout the world the efficiency of farming has been continually increasing owing to the new discoveries of science, to improved varieties of wheat, and to the adoption of better cultural methods.

Human Side of Agriculture.

So much for the business side of agriculture—an agriculture reasonably profitable and highly productive. What now on the human side? What is to be the development of the farmer as a man to match the development of his business as an occupation. Agriculture is not only a business.

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Industrial Court President

President of the Industrial Court and Chairman of the Prices Regulation Commission since 1915, Dr. W. Jethro Brown has spent nearly 10 years deciding questions connected with industry. During that time he has given many decisions, of which there have been few unsatisfactory ones.

Dr. Brown is looked upon as one of the most distinguished legal lights not only of South Australia but of the Commonwealth. He was born at Mintaro, in South Australia, in 1868, and was educated at Stanley Grammar School. From there he went to St. John's College at Cambridge, and quickly made his mark. He graduated with double first-class honors Law Tripos in 1890, and was called to the Bar at the Middle Temple in the following year. In 1892 he was elected McMahon Student of St. John's College.

Following this Dr. Brown had much experience in Australia and London. He was appointed Professor of Law and Modern History at the Tasmanian University from 1893-1900, and was acting

Dr. W. Jethro Brown

professor of law in the Sydney University in 1898. From 1900 to 1901 he was Professor of Constitutional Law and History at the University College, London, and from there he went to University College in Wales as Professor of Comparative Law. He remained there from 1901 to 1906. At the same time he acted as examiner for the Cambridge Law Tripos from 1902 to 1905 and examiner for the University of London from 1905 to 1906.

He was chairman of the Australian Commonwealth Royal Sugar Commission from 1912 to 1914 and Professor of Law at the Adelaide University from 1906 to 1915, when he received his present position.

Dr. Brown is the author of many publications dealing with law and legislation. He has also contributed articles to well-known journals in all parts of the world. His recreations are golf, tennis, and motoring.

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We have received a pamphlet containing the annual report for 1924 of the University of Adelaide.