144

REGISTER. 11.8.35

SCIENCE AND AGRICULTURE

Rainfall and Yield.

Pasture Developments.

No. 12.

Continuing his address at the University extension lectures, Dr. A. E. V. Richardson (Director of the Waite Agricultural Research Institute), dealing with the relation between the wheat yield and the average rainfall, said it was evident that the whole of the rain falling between April and October could not be used by the wheat crop. Portion must inevitably be lost by evaporation from the soil. It was not easy to determine what proportion of the seasonal rainfall was thus lost. The losses could be ascertained with certainly only by growing the crops under field conditions in specially constructed and costly drain gauges. Large as the losses by evaporation might be, it was probable that they were at least counterbalanced by the moisture conserved in the soil from the previous year by fallowing. Investigations had shown that fallowed land in the Wimmera contained at seed time at least 4 to 5 inches more moisture than non-fallowed land. That was equal to 33 to 40 per cent. of the rain which normally fell between April and October. If they assumed that the water lost by evaporation from the soil was approximately equal to that conserved in the soil by fallowing, the whole of the seasonal rainfall was then available for purposes of transpiration. As the composite seasonal rainfall for the past 33 years was practically identical for Victoria, South Australia, and the Wimmera, namely 11½ inches, it would appear that the maximum possible production on the rainfall would be 11½ x 3.54—slightly over 40 bushels per acre! At present the average production did not approach that. South Australia secured much less than a third of that yield, Victoria slightly more than one-third, and the Wimmera farmers about one-half of those possible yields. Were there, he asked, any farmers who secured yields approximating those? An example where the records of rainfall and crop yield are well known to thousands of wheatgrowers, was seen on the Longerenong Agricultural College Farm, where the yields of wheat over an average area of 300 to 400 acres had in recent years been remarkable. On that farm the Victorian Department of Agriculture established in 1912 an experiment station to investigate wheatgrowing problems. Cultivation, variety, manurial, rate of seeding, time of sowing, and crop rotation tests had been conducted for the past 12 years. As the lessons from these tests become manifest they were gradually put into practice on the farm area. The yields of wheat for an average area of over 300 acres for 10 years under crop were summarized in the following table:—

Table Showing Total Rainfall, Seasonal Rainfall (April to October), Crop Yield, and Ratio Wheat Yield to Rainfall at the Longerenong College Farm.

Season.	Total Rainfall. Inches.	Winter Rainfall. Inches.	Yield per Acre, Average of over 300 acres, in Bushels.	Ratio Wheat Yield to Rainfall.
1915	16.6	13.0	24.0	1.8
1916	21.5	16.1	34.1	2.1
1917	16.8	12.8	30.5	2.3
1918	14.7	11.9	36.2	3.0
1919	11.5	6.9	27.1	3.9
1920	15.1	11.3	38.0	3.4
1921	17.6	10.7	42.0	3.9
1922	16.3	9.0	30.0	3.3
1923	15.7	12.0	47.3	3.9
1924	18.0	12.7	41.0	3.2
Average for 10 years	16.27	11.84	35.5	3.0

On an average winter rainfall of 11.84 in., the average yield of the whole farm, representing from 300-400 acres under crop, had been 35½ bushels per acre. Exactly three bushels per acre had been reaped for each inch of winter rainfall. For the past five years the results were even more striking. On an average winter rainfall of 11.1 in., an average yield of 39½ bushels per acre had been obtained, or 3.51 bushels for each inch of winter rain! Results such as those indicated very clearly that with a winter rainfall of less than 12 in. it was possible to obtain far greater yields than were at present being obtained. Nor was that farm an isolated case. There were probably many farmers, both in the Wimmera and in South Australia who regularly secured yields approaching the maximum which might be expected from the winter rainfall. He gave two authenticated cases:—The Nhill Agricultural Society had for the past 25 years conducted crop competitions for the best crop of the district. Each year the crops entered for competition had been judged by responsible officers of the Department of Agriculture, and crop yields had been carefully determined. Among the many farmers who had competed for those competitions were R. O. Blackwood, of Kiata, and W. Dahlenburg, of Salisbury, Victoria. Mr. Blackwood's crop for five years on a winter rainfall of 11.39 in. was 39.6 bushels per acre, an average of 3.48 bushels for each inch of rain. Mr. Dahlenburg, on lighter rainfall country, over a five-year period averaged 31 bushels on 8.5 in. of winter rain—a return of 3.6 bushels for each inch of winter rainfall.

CONTINUED

"It is evident then, continued the lecturer that there were cases where men were securing the full wheat yield expected from the rainfall, and it was safe to say that if the many could be encouraged to do what the few were already doing, the average wheat yield of the State could be greatly increased. The composite winter rainfall for Victoria and South Australia over a 30-year period was 11½ in. If they assumed that the water losses from the soil by evaporation were balanced by the water conserved by fallowing, thus making available the whole of the winter rainfall for transpiration, then the average rainfall of the State was sufficient to produce an average yield of 40 bushels per acre. That average had actually been obtained for the past five years by their best farmers, though the present State production was much less than one-third of that amount. Clearly then, wheat production, both in Victoria and South Australia might be greatly increased before the limits imposed by the rainfall were approached.

Development of Pasture Land.

The natural pastures of Australia supported practically the whole of the sheep and cattle of the country. As wool and live stock contributed in such a large proportion to the w ealth of the country, the study of the principles underlying the successful production of grass was of great importance. Grass was Nature's forage, the healthiest and most nutritious food for live stock. Australia's native grasses were justly famous for their grazing and their d rought-resistant qualities. They were noted for producing the finest and best wool in the world, and for withstanding great extremes of heat and drought. No other plants had proved equal to their own for the drier parts of Australia. Though Australia had a wealth of native grasses and fodder plants, there were relatively few edible leguminous plants, and no indigenous plants of the genus Trifolium the clover family. The clovers and trefoils grreatly improved the succulence and the nutritive value of pastures, and materially assisted in improving the fertility of the soil, because of the capacity to gather nitrogen from the air. Though the pasture plants of the drier portions of Australia were unrivalled for their grazing and wool-producing value, it was true that in the moister costal region introduced grasses and fodder plants thrived exceptionally well. While, therefore, they should continue to rely on the native grasses for the great bulk of the pasturage, they should not hesitate to use introduced grasses, clovers and fodder plants in the moister regions of Australia where the soil and climatic conditions were very favourable for their development. It was a matter of common observation that many of the native pastures showed signs of deterioration. The quality of the herbage had fallen off, and in some cases, the live stock showed evidences of malnutrition. Instances of that might be seen in every district, but the most striking cases were those in the older settled areas of good rainfall. Natural pastures deteriorated in several ways: — 1. Overstocking and injudicious grazing. 2 Continual removal from the soil of the elements of nutrition by the annual crop of wool, lambs, and fat stock without the replacement of these nutritive elements by means of fertilizars. In addition, in the heavier rainfall district mineral nutrients, e.g., nitrates and lime, are actually leached out of the soil by the heavy rains.,

Overstocking.

By injudicious grazing and overstocking, the doctor said, the better and finer grasses tended to disappear, and poorer types of indigenous vegetation and weeds were left in possession of the land. Overstocking was bad enough in normal seasons, but in drought years it led to disastrous results. In such years the better types of native grasses were eaten or killed out owing to their slow growth and non-seeding habits. Those grasses were replaced by such plants as barley grass (Hordeum murinum) and the useless soft Brome (Bromus mollis), barren fescue (Festuca Bromides), thistles of various kinds, Cape weed, and plants of low grazing value. The spread of noxious weeds had lowered the grazing value of many fine pastures, and had in places detrimentally affected land values. Even in normal times many stock owners carried stock in such large numbers that the good grasses had no chance to seed, with the result that the better grasses were gradually replaced by introduced or noxious herbage of lower grazing value than the original pasture. It was natural that the grazier should endeavour to carry as large a number of stock as possible, but, though he might gain a temporary advantage with heavy stocking, in the long run the financial results must be unsatisfactory, as the grazing value of the pastures would steadily deteriorate. Pastures should neither be overstocked nor grazed in large areas. Drought years would always seriously affect the pastures, but the evil effects of drought might be greatly lessened by the conservation of fodder in good seasons, improvement in the water supply, increase of irrigation areas, provision of greater transport facilities, which would permit of speedy agistment of stock in such years.

(To be continued.)

ADV. 7.8.25

Mr. Birrell said the Administrator's speech omitted mention of the Law Reform Commission, and he had hoped that something could have been said regarding its activities. It had presented two reports to Parliament, one dealing with the jury system and the other with conciliation courts. Surely those reports were worthy of the consideration of the Gov-

iration Court. The British Labor Party was opposed to arbitration, yet a comparison of wages paid in Australia and Britain showed that conditions were better where arbitration ruled. He regretted the length of the Parliamentary recess, and believed that the business of the State, like other businesses, should be conducted in the daytime. It would be better if two sessions were held annually, and then the Government would not be compelled to do so-called unconstitutional acts because the meetings of Parliament were so far distant. He protested against the action of the University Council in allowing Dr. Heaton, lecturer in Economics in the Adelaide University, to go to Canada. It would, he said, be a great loss to the State and a corresponding gain to Canada. He felt that Dr. Heaton was leaving for reasons that were not very creditable to those concerned—the members of the University Council. It had been frequently urged that a Chair of Economics should be established in the Adelaide University. Dr. Heaton was fitted in every way for the position. They had reason to believe, however, that while he remained in this State no Chair of Economics would be established. It appeared that the hostility of members of the Council arose from the fact that they considered Dr. Heaton had advanced views, yet if they looked at the classes this talented scholar had established in Adelaide they would find that they were attended not only by working men, but by people of leisure, professional people, and people of the most divergent political views. One came to the conclusion that the doctor spoke as he saw things, and that his teaching impressed those who were his scholars. The Workers' Educational Association had done nothing better than to bring Dr. Heaton to this State. During his stay in Adelaide he had given all classes a better knowledge of international affairs, economics, and social problems than any other man who had been in South Australia. If it was a fact that the University Council, because it was opposed to the doctor's views on economics, had deliberately refused to establish a chair in that subject, its action was to be deplored. Dr. Heaton would probably gain by going to Canada. The people over there had, no doubt, been impressed by his ability. It was not so, however, with the Adelaide University Council. Like so many other good men, his abilities had not been recognised in this State and he was going elsewhere. He would gain financially by the change, but he loved his work so well in this State, and he was so loved by the people with whom he came in contact, that he would have made considerable sacrifices to stay here.

Mr. Coneybeer—We are losing a very valuable man, indeed.

Mr. Birrell—He has done so much to help the people of South Australia to understand international, social, and economic problems that I have taken this opportunity of raising my voice against allowing such a man to leave these shores.

ADVERTISER 10.8.25

INTER-UNIVERSITY DEBATES.

The inter-University debates, as already mentioned in "The Advertiser," will commence at Sydney on August 20, when the Adelaide team will oppose Queensland on the question whether the entry of women into professional and political life is to be deplored. The losers will meet Melbourne or Sydney on the subject of the capital levy. The Adelaide representatives will be Messrs. B. Harford, B. Griff, G. Parry, and D. P. McGuire, who will leave Adelaide on August 17.

REGISTER 7.8.25

SCIENCE AND AGRICULTURE

Increasing Rural Production.

New Sources of National Revenue.

No. 11.

Continuing his address at the University of Adelaide extension lecture course, Dr. A. E. V. Richardson (director of the Waite Agricultural Research Institute), referring to the development of the wheat industry, said it was a matter of common observation that a close relationship existed between the average wheat yield and the rainfall, especially the rainfall during the growing period of the crop. If they compared the average wheat yield of the State in bushels per acre with what might be termed the composite average rainfall during the growing period of the crop—April to October inclusive—a rather striking correlation was found. In order to determine the average winter rainfall for South Australia, the rainfall from April to October at 20 typical wheat stations was taken for a period of 35 years. The centres selected were:—Cowell, Streaky Bay, Fowler's Bay, Maitland, Paskeville, Orroroo, Redhill, Snowtown, Gladstone, Crystal Brook, Yacka, Saddleworth, Mallala, Balaklava, Wilmington, Coonalpyn, Bordertown, Loxton, Blanchetown, Eudunda. The accompanying graph shows the variations in the average yield of wheat in bushels per acre, and the composite rainfall during the cropgrowing period in inches for 35 years for South Australia. From 1890 until 1910 the line representing the average yield of wheat for South Australia in bushels per acre was considerably below the line representing the composite seasonal rainfall expressed in inches of rain. The two graphs representing rainfall and wheat yield showed on the whole a gradual convergence from 1891 to 1910. During these years the wheatgrowers of South Australia reaped little more than a half a bushel of wheat for each inch of winter rainfall. From 1911 to 1924, with the exception of the drought year, 1914, the two lines almost coincided, and in 1911, 1912, 1916, 1920, 1924, the graph representing the average yield in bushels per acre was slightly above the graph representing the rainfall in inches. These latter were the years when the average wheat yield in bushels per acre slightly exceeded the seasonal rainfall in inches, i.e., when the wheatgrowers as a whole reaped more than a bushel of wheat for each inch of seasonal rainfall. The increase in efficiency in wheatgrowing was thus strikingly illustrated. If they left out of consideration the two abnormally dry seasons of that period—1902 and 1914—and compared the last 10 years with the 10 years prior to the 1902 drought, they got a striking comparison. For the 10 years 1892-1901, the average wheat yield of South Australia was 4.74 bushels, and throughout that period the wheatgrowers obtained .41 bushels of wheat per acre for each inch of winter rainfall. For the past 10 years the average yield was 12.45 bushels per acre and the average rainfall 12.73 inches. Hence, the wheatgrowers reaped .98 bushels of wheat for each inch of rain. At the present time the average wheat yield of the State was approximately one bushel for each inch of winter rainfall received. The same general relationship holds for Victoria. The accompanying graph showed the fluctuations in the wheat yield and the composite winter rainfall for 35 years. From 1890 to 1907 the line representing the composite winter rainfall in inches was above the line representing the average yield of the State in bushels per acre, though the two graphs as before show a gradual convergence. From 1908 to 1924 the line representing the wheat yield was above the seasonal rainfall in no fewer than 12 seasons out of 14. Comparing as before the last 10 years, with the 10 years prior to the 1902 drought, we get a striking result. For the 10 years 1892-1901 the Victorian wheatgrowers averaged 7.65 bushels on an average winter rainfall of 11.49 inches or .67 bushels per acre for each inch of winter rainfall. During the last 10 years they averaged 14.38 bushels on an average winter rainfall of 12.9. Hence, for each inch of winter rainfall for the past 10 years they reaped 1.13 bushels per acre for each inch of rain received.

Thus both in South Australia and Victoria the increase in efficiency, as revealed by the ratio of wheat yield to rainfall, had been marked. That, too, in the face of the fact that during the last decade large areas of new mallee land with a low rainfall had been added to the wheat belt of each State. In those newer mallee areas, which now formed a considerable proportion of the wheat belt of each State, wheatgrowers had not yet been able to completely abandon pioneering methods which in the mallee always resulted in low average yields. Advanced methods of wheat farming could not be applied to those mallee areas until the mallee shoots and roots were completely eliminated from the land, a process which took from seven