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THE RELATIONSHIP BETWEEN RAINFALL AND MILK YIELDS
IN A LOWER NORTH COAST DISTRICT, NEW SOUTH WALES

By E. Waring

Mr. Waring, an Assistant Director of the Bureau of Agricultural Economics, Department of Primary Industry, Canberra, prefaced his talk with a survey of the many attempts, both in Australia and overseas, to develop an objective relationship between rainfall and crop yield, and from rainfall through plant growth to the yield of animal products. These began with Henry Wallace's work in the United States on the relationship between rainfall and maize yields. Other investigations mentioned related tobacco, wheat and wool yields to various soil moisture parameters - some for limited areas, other for large regions.

The investigation which Mr. Waring went on to outline, was undertaken whilst he was on the staff of the University of New England. He mentioned the motivation for his line of research and outlined the basis of his analysis. Based on 22 years of rainfall and production records from the dairying district of Bellbrook on the New South Wales Lower North Coast, it was found necessary to eliminate the years before 1943 and also after 1960 when the number of suppliers in the area had dropped to about 60 (from more than 200 in 1940).

The "normal" seasonal rainfall variation of the Bellbrook region was discussed in relation to the main features of the production curve for cows calving in August. Mr. Waring then presented a series of regression equations in the form:

$$\text{Factory Output} = N (a + b_1 x_1 + \dots + b_n x_n)$$

where N is the number of cows in the registered dairies in the given year,
 a, b are constants and
 $x_1 \dots x_n$ are monthly rainfalls.

Several interesting results emerged; most significantly it was found that over 90 percent of the annual variance in milk yields could be attributed to the variation of rainfall in April (three or four months before the cows calved) and in the two spring months, September and October. These were months of lowest median rainfall and greatest rainfall variability.

Several other factors affecting production were noted, particularly the use of fertilizers and irrigation.

A lively and most interesting discussion followed, with several ideas and contributions from the agriculturalists present. Professor Forster sought an agricultural interpretation of the importance of April and September rainfalls in terms of fodder species. Mr. Gibbs discussed the shape of the rainfall frequency distribution curve and the speaker agreed that it was neither normal nor log-normal. Mr. Hounam mentioned work of a similar nature in Great Britain, which however, included soil temperatures in the analysis and which was found to give extremely good prediction; he asked if Mr. Waring had looked into soil temperatures in his work. The speaker replied that no adequate temperature data had been available. This led to a discussion of the physical basis of the temperature effect and the question of soil nitrogen content. Further questions sought views on the potential of the method which the speaker had outlined and the effect on production of day-to-day weather and various other factors.

J. W. Z.