Range Production as Related to Soil Moisture and Precipitation on the Northern Great Plains

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THE importance of proper rangeland management and control of range livestock numbers from year to year is well known to range men in the Northern Great Plains. The quantity of native grass varies greatly from year to year in this region, because of the wide fluctuation in precipitation. For this reason, many ranchers protect themselves against the unpredictable bad years by grazing moderately every year. This often results in a tremendous waste of grass in good years. It is obvious that a reliable method of predicting range production in advance of the grazing season would be of great value to ranchers. They could increase or decrease livestock numbers and manage their rangeland in accordance with the predicted amount of native grass for the coming season. In an attempt to develop a method of prediction, a study was made of the relationship of the amount of fall soil moisture to range production the following year at the Northern Great Plains Field Station, Mandan, N. D. The relationship of precipitation from April to July, inclusive, to current season production was also studied. Eighteen years data were available for studies of forage production as measured by hay yields. Nineteen years data were available for beef production as measured by gains.

REVIEW OF LITERATURE

Certain investigators have found a rather close relationship between the yields of both winter and spring wheat and the amount of soil moisture at seeding time. Hallsted and Coles (4) showed in their studies that there was a high correlation between the percentage soil moisture in the surface 3 feet at seeding time and the yield of winter wheat the following year. They suggested that the principal use of their data would be for the purpose of predicting crop failures. Among their conclusions was the statement that the smaller the quantity of stored moisture at seeding time, the more dependent the crop on the weather during the growing season and the greater the chances of a failure.

Hallsted and Mathews (5) studied yields of winter wheat and soil moisture data from three stations in central and western Kansas. They were able to show from their data that there was a close relationship between the depth to which the soil was wet in the fall at seeding time and the yield of winter wheat the following season. They were also able to show that the depth to which a given soil is wet is a reliable measure of the amount of available water in that soil.

Data from 15 stations in the Great Plains were used by Cole and Mathews (3) to show the relationship between the depth to which soil was wet at seeding time and the yield of spring wheat. They concluded that when the soil was wet only 1 foot or less seeding was not warranted because of the frequent failures.

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2Agronomist, Division of Forage Crops and Diseases, and Associate Agronomist, Division of Soils, Fertilizers, and Irrigation, respectively. Mr. J. T. Sarvis was in charge of the project under which these investigations were carried on from 1915 to 1941, inclusive. The collection of most of the soil moisture data was under the supervision of Mr. J. C. Thysell.

3Figures in parenthesis refer to "Literature Cited", p. 388.