

THE LAND-VARIABILITY FACTOR IN CATTLE-GRAZING EXPERIMENTS

A. L. HORMAY AND J. R. BENTLEY

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION*

IN MANY TYPES of agricultural experiments the factor of land variability is controlled to a satisfactory degree by using plots of suitable size and shape, by adequate replication, or by other elements of design. In cattle-grazing experiments land variability is not easily overcome. The cost of setting up pastures that often cover 100 acres or more usually makes it impracticable to use more than two or three replications of a given treatment. Furthermore, these experiments are conducted on ranges that typically are highly variable. Even where special care is taken in selecting the experimental site to ensure uniformity, land variability is not satisfactorily eliminated, and experimental results therefore are often difficult to analyze.

A cattle-grazing experiment that is being carried on by this Station illustrates the point. Close study of this experiment has pointed to the possibility of measuring range variations in pastures and using the information in interpreting the results of treatments. Highly important practical results have been obtained from the experiment to date. By the application of suitable statistical methods probably still more information can be extracted from it. The basic problem involved is presented here briefly for consideration by statisticians.

The purpose of the experiment is to determine the effect of three intensities of grazing on the yield and composition of forage and on livestock production in terms of pounds of meat produced. The experiment was set up to run over a period of years, since forage variations and their effect on livestock occur gradually.

Three paired pastures were used—two 160 acres, two 240 acres, and two 320 acres. They were rectangular, roughly twice as long as wide, and were arranged in a block so that no two pastures of the same size lay side by side. Each pasture was stocked with 15 cows and their calves so that the whole experiment provided three intensities of grazing—light, moderate, and heavy. The cattle were grazed in the pastures from January to August, a season that includes most of the green-forage period and about a month and a half of the dry period. The cattle were weighed individually at the beginning and at the end of the grazing season and at three other times in between. Vegetation changes were measured in terms of density and composition, and the degree of grazing was judged by the amount of forage left on the ground at the end of the grazing season.

The first four years of data showed that intensity of grazing and weight gains of the livestock were not consistently correlated with size of pastures. For example, each year about twice as much forage was left in one of the 160-acre

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