THE USE OF MODERN STATISTICAL METHODS IN FIELD EXPERIMENTS

S. C. Salmon

IN considering statistical methods for interpreting the results of field experiments, all, no doubt, will agree that in order to be useful, these methods must not only be sound in themselves but also that they be soundly applied; specifically that the assumptions on which they are based be valid. It seems clear that in many cases the assumptions underlying such usage in the past were not valid, and furthermore, that some of those underlying a similar use at the present time are at least questionable. The primary purpose of the present paper is to indicate the need for critical consideration of the assumptions involved whenever modern statistical methods are used in interpreting the results of field experiments.

The subject matter of this paper can be epitomized by a statement a former teacher of biometry often repeated to his classes. The statement was about as follows: "The statistical method is nothing but common sense expressed in the most beautiful language." There was at least one member of the class who did not understand the language very well. Others were more impressed and intrigued by its beauty and its elegance than with the thoughts it was intended to convey, and probably many failed to realize a very important implication, namely, that if the statistical method is nothing but common sense expressed in a different language, then deductions based on statistical interpretations and those based on common sense ought to agree. Furthermore, if they do not agree, something is wrong with either the statistics or the common sense.

It should not be inferred that when there is disagreement the statistical method or its application is always at fault. Such is believed often to be the case and that viewpoint will be stressed not because it is the only one worthy of emphasis but because it has received, it seems, too little attention. It should be noted, however, in passing, that common sense in itself is not a sufficiently reliable guide to what is true and correct. Too often it serves only as a cloak or a blind for ignorance, prejudice, and preconceived opinions. In fact, one of the greatest advantages that may be claimed for the statistical method is that it aids in arriving at truly objective interpretations. Perhaps it is sufficient for the present to be reminded that it was prejudice supported by common sense that would have sent Galileo to the stake had he not recanted, led Lavoisier to the guillotine in the French Revolution, would have stopped Pasteur's work with anthrax and rabies, and would have sent Harvey to an insane asylum had it prevailed.

Moreover, let no one assume it is only the ignorant and the uninformed who are swayed by prejudice. Probably no one so frequently

---

1Contribution from the Division of Cereal Crops and Diseases, U. S. Dept. of Agriculture, also presented as part of a symposium on "The Use of Statistical Methods" at the annual meeting of the Society in New Orleans, La., November 22, 1939. Received for publication February 23, 1940.

2Principal Agronomist.