

Discussion of "Statutory and Recommended List Trials of Crop Varieties in the United Kingdom", by H. D. Patterson and Valerie Silvey, Journal Royal Statistical Society, Series A, 143(2).

by
Walter T. Federer

BU-738-M

December 1980

ABSTRACT

The need for the planning, organizational, modeling, and techniques aspects of investigations is emphasized. Some comments on new types of experiment designs are presented, including some relevant references.

Discussion of:

STATUTORY AND RECOMMENDED LIST TRIALS OF
CROP VARIETIES IN THE UNITED KINGDOM

BY

H. D. Patterson and Valerie Silvey

Walter T. Federer (Cornell University): It has become commonplace in statistical publications to ignore the planning, organizational, modeling, and techniques aspects of an investigation (see, e.g., any statistical methods or mathematical statistics textbook). This paper addresses the problems to some extent and thus is a welcome addition in extending our statistical horizons. More literature of this nature is needed as soon as one realizes that the problems cannot be relegated to the investigator. The following comments, then, are given in the spirit of supplementing the present exposition. The Yates-Cochran paper is a classic, and is one of the first data analytic papers. The present paper contains some data analytic, some model selection, and some statistical computing aspects, but extensions to all these will be required for future investigations. In connection with interactive statistical computing, it should be noted that various procedures for checking additivity and the Yates-Cochran procedures could be incorporated into the computer program.

The experiment design in Table 4 is a special case of a class of designs given by W. T. Federer and D. S. Robson (1952), "General theory of prime-power lattice designs. VI. Incomplete block design and analysis for p^5 varieties in blocks of p^2 plots", Cornell University Agricultural Experiment Station Memoir 509, pages 1-37. Also, there are additional methods for constructing incomplete block designs. In addition to the ϕ -series and α -series designs, R. G. Jarrett and W. B. Hall (1978), "Generalized cyclic incomplete block designs", *Biometrika* 65(2):397-401, have used a cyclic method of construction which they say obtains the α -designs of Patterson and Williams (1976). The above two methods of construction are supplemented by a third one (M. Khare and W. T. Federer (1980), "A simple construction procedure for resolvable incomplete block designs for any number of treatments", *Biometrical Journal* 22, (to appear)), wherein an algorithm is given for constructing $(0,1)$ -designs for $v = kp^{n-1}$ treatments in blocks of $k \leq p$ when blocks of size k and $k-1$ are permissible, then v may be any integer less than p^n , $n=2,3,\dots$. The number of distinct complete blocks available for $(0,1)$ -designs depends upon whether p is

a prime, in which case $p^{n-1} + p^{n-2} + \dots + p^2 + p + 1$ distinct confounding arrangements are possible. When p is a prime power, and if one uses orthogonal latin squares instead of the algorithm to obtain the confounding arrangements, then there are $p^{n-1} + p^{n-2} + \dots + p^2 + p + 1$ distinct complete blocks; one may then use a variety cutting procedure for $v = kp^{n-1}$ treatments in incomplete blocks of k . For p not a prime and p_0 is the smallest prime in p , then $p_0^{n-1} + p_0^{n-2} + \dots + p_0^2 + p_0 + 1$ distinct $(0,1)$ arrangements can be obtained by the algorithm. The use of orthogonal latin squares will allow additional distinct confounding arrangements to be used. Additional references for constructing various types of designs may be found in W. T. Federer and L. N. Balaam (1972), Bibliography on Experiment and Treatment Design Pre 1968, published for the I.S.I. by Oliver and Boyd, Edinburgh, 769 pages.