THE ACCURACY OF INCOMPLETE BLOCK DESIGNS
IN VARIETAL TRIALS IN WEST VIRGINIA

E. J. WELLHAUSEN

Since 1938, various incomplete block designs have been used in yield trials of different varieties of crops in West Virginia. A balanced lattice design with nine varieties and four replications has been used in testing hybrid corn throughout the state in cooperation with county agricultural agents and farmers. A similar design with 16 varieties and five replications has been used in testing varieties of tobacco and soybeans at the Lakin experimental farm, and since 1940 lattice square designs involving 25 and 49 varieties have been used quite extensively for corn yield trials on the state experimental farms.

From a study of uniformity data Yates (5) has reported an increase of from 20 to 50% in efficiency over ordinary randomized blocks by the use of incomplete block designs. Goulden (2), also from a study of uniformity data, reports similar increases in efficiency, the increases being partially correlated with soil heterogeneity. Cochran (1) in yield trials with corn in Iowa has shown that for lattice square designs the increase in accuracy over randomized blocks represents a saving of about one replication in six with 25 varieties, one replication in five with 49 or 81 varieties, and one replication in three with 121 varieties. Zuber (9) using corn uniformity trial data compared lattice designs assuming 25, 49, 81, and 121 varieties with ordinary randomized blocks occupying the same plots. He shows an average gain of 36% in favor of the lattice designs calculated with recovery of inter-block information.

So far little or no information has been presented concerning the accuracy of incomplete block designs with less than 25 varieties. It is the purpose of this paper to present primarily the accuracies obtained in West Virginia with 66 corn varietal yield experiments designed as balanced lattices with nine varieties each in comparison with randomized blocks occupying the same plots and replications. Also, data are presented to show the efficiency of balanced lattice designs with 16 varieties and the lattice square designs with 25 and 49 varieties relative to randomized blocks.

BALANCED LATTICE DESIGNS WITH 9 VARIETIES,
4 REPlications, 12 INCOMPLETE BLOCKS

DESIGN AND VALIDITY OF COMPARISONS

In 1938, a cooperative program between the West Virginia Agricultural Experiment Station and Extension Division for testing