USE OF PUNCH CARDS TO PROCESS SMALL GRAIN YIELD DATA

SMALL grain breeders have made only limited use of punch card methods in handling their data, although some corn breeders have used this system for many years. The 1951 season completed the fourth year that data from the barley, wheat and oat breeding projects at the Missouri Agricultural Experiment Station have been processed, tabulated and printed with the aid of IBM punch cards. During this period the efficiency of handling small-grain-yield-test data by these methods has been well established. A summary of the procedures carried out with the aid of punch cards and the advantages in their use is presented here.

PROCEDURE

As practiced at the Missouri Agricultural Experiment Station, the procedures may be divided into four steps:

1. **Individual plot data are recorded on punch cards.** Before initiating the punch card system, specific columns on punch cards are assigned to the various categories of data to be recorded and for identification of the card. A field notebook sheet is then printed with note columns labeled to correspond and numbered in the same sequence that they appear on the punch card. On the oats notebook sheet, for example, spaces are provided at the top for recording the year, station, test, and replication. The name, accession number and item number of 40 varieties can be listed, with spaces for notes on date planted, date ripe, height, lodging, crown and stem rust (percent and type), smut, reaction to Victoria blight, test-weight and yield. Fourteen additional spaces on the card are available for other notes. Cards are punched and verified directly from the field notebook books. A separate card is punched for each variety.

2. **All data for each variety in an experiment are listed and totaled.** Each small grain variety test at the Missouri Agricultural Experiment Station usually consists of 25—40 items, grown in randomized blocks with 3—5 replications. After being recorded on punch cards, all of the data for each variety, replication, and totaled. The variety performance for the test or experiment can then be obtained by dividing the number of replications, the only hand calculation required.

3. **Variety, replication and experiment totals and total sums of squares for yield are obtained.** Variety yield totals are obtained in step 2 above. Replication and experiment totals and total sums of squares for yield, data needed in the calculation of an analysis of variance for the experiment, may then be obtained automatically, either with a tabulator or a calculating punch. With the aid of a reproducing punch the entire analysis of variance may be completed on the machine.

4. **Performance of each variety in an experiment is recorded on a new card.** The performance of the variety in each replication is punched on a separate card in step 1. The performance of the variety in the experiment is obtained from averages of the several replications. These data are recorded on a new card. The cards may be used for the following purposes:
   - Permanent record of the variety performance in a specific year, station and experiment.
   - Machine-printed lists of varieties and data may be reproduced. (Varieties may be arranged in order of yield or other desired sequence.)
   - Data from variety tests grown at several locations in the same season can be listed and analyzed.