Keeping Track of Weed Research By Computer

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In trying to keep up with the growing volume of research data on weed control, we found that a computer system provides more information in much less space and with considerably less man time than the conventional method of handwritten reports. Further, a computer system provides the researcher with the opportunity to retrieve any information he needs and to do so guickly.

During the last 30 years, weed researchers with industry, universities, and governments, all members of the Canada Weed Committee, have provided reports of their work each year in the C.W.C. Research Report. Essentially the reports contained information on crop tolerance and weed control efficiency. In recent years the volume of such reports has grown tremendously. For example, the 1974 Research Report contained 446 pages. By 1977 the size had increased to two volumes and 709 pages. So the time was right to explore the use of a computer for collecting and printing a master copy of the Research Report.

Until 1974 each abstract on a weed control experiment in Western Canada was written in narrative form. Each year the Canada Weed Committee sent instructions to weed workers on the form and factors to be included in the abstract. However, the size of the reports was increasing at an alarming rate and still much important information was missing.

In 1974 we began work on designing a standardized form that could handle all the pertinent information: basically a set of questions with a specific space for the answers. This information could then be keypunched onto a magnetic tape and the computer then would rearrange the information into a standardized printout of the report.

We found that 51 factors accounted for 95% of the information. So we designed a Data Input Sheet with space for 58 factors. These factors were divided into three different categories. Category one contained information on plot size size, temperature, precipitation, title, author; general information about the experiment. Category two contained factors directly related to the herbicide treatments, such as rates, volume, pressure, weed stage, and crop stage. Category three contained factors related to the results, such as sample size, date of sampling, yield, and so on. Each category had one page only.

Information is entered on the Data Input Sheets in three different ways. Some information can be entered directly, such as the variety name of the crop. For 14 other units of information we use code numbers to avoid confusion. For example, a herbicide can be named by a company code number, or by a common name, or by a trade name. We used a code number and standardized the herbicide names by using only the common names. In only one case did we use a combination of code numbers and actual direct entry and that was for describing the stage of the crop or weed. The number of leaves was entered directly, but we used codes for the flower and fruit stage. In all cases we standardized the information for any one factor. For example, all crop yields are reported as "g/m²". (grams per square meter).

Here is how the system works:

Each year the worker completes one set of three Data Input Sheets for each experiment and sends them to the computer unit at a central location. The information is keypunched and fed into the computer. The computer organizes the data and prints the report, written in brief form (crop, spring wheat) and reduces the space by 40%.

So in effect a lot more information goes on the standard $81/2 \times 11''$ sheet. Each line contains 108 characters, enough to cover herbicide treatment, crop tolerance and weed control.

The second phase will focus on a data retrieval system, which we call "data comparisons." For example, a program will be set up so the computer can scan all available data on barban used at 0.56 kg/ha, including crop yields. When this combination occurs in an abstract the computer will remember. With the proper instructions the computer will scan all entries and print out the average yield from the specific rate. The instructions will contain one qualification: The entry must contain information on a corresponding check plot and so the average values from the check plots will be printed out as well.

Another important feature of Data Comparisons will be the selection of factors that affect crop tolerance and weed control. For example, temperature will be one of 25 such factors. The researcher will be able to select one of the three temperature ranges: less than a specified temperature, between two specified temperatures and over a specified temperature.

Programming the retrieval system this way greatly increases the accuracy of the information and reduces the ambiguity of data comparisons.

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Author's Note: The computer system collects weed control information from experiments with annual crops and annual weeds. It will handle data from perennial weeds but treats each experiment on a yearly basis. Range weeds are not on the system at present but could be added.