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Data Bases In Agricultural Applications

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What Is a Data Base?

A data base is any collection of information that you wish to keep for use in either the farm business or for personal reasons. Anyone who has been keeping records, be they recipes, herd summaries or equipment records, has been data basing. Data bases may contain words, numbers and symbols. Your local library is an excellent example of a large data base. More typically, a data base will be a collection of information on a specific subject. Agricultural applications for a data base would include maintenance of herd or field records for sorting on key variables, maintenance of mailing, purchase or inventory lists and spray records on various types of chemicals.

How is a data base program different from other programs or methods? Individuals often feel that a calculator may be sufficient for their computational needs. Once they progress to the use of spreadsheets, they often feel that that tool will do just about everything. Why should someone be interested, then, in a data base program? In comparing spreadsheet and data base programs, the following points may clarify the differences:

- Spreadsheets are limited in the number of observations they can process efficiently.
- Many spreadsheets have no sorting capability or have very limited sorting abilities compared to a data base program.
- Spreadsheets have limited report form formatting. Once the form of the report has been designed, it is difficult to make other than minor changes.
- The best use of spreadsheets is where additive, algebraic or other mathematical properties are needed to manipulate a moderate-sized data base within which many "what if . . .?" kinds of questions are asked.

- Data base programs are best suited where a large information base is continually updated, manipulated and expanded. Sorting and basic mathematics can easily be performed since size of the data base is not a practical constraint.
- Spreadsheets and data base programs are complementary. Spreadsheet applications typically center around such functions as budgeting, ration balancing and cash flow statements. Data base applications, by contrast, usually center around such functions as inventory management, crop records, herd management records and the ever-popular mailing list. At times, information in a data base might be exported to a spreadsheet. As an example, quantities of chemicals used might be exported from a crop history data base to a spreadsheet for use in projecting a budget for the coming year.

What Is a Data Base Program?

A data base program is a way to computerize record sheets, card files and shoeboxes. The program should file your information, allow you to manipulate it and retrieve it. To do that, the program has to be able to search the entire information set for the selected data that matches certain requirements, and it then has to sort the information into an order that makes sense to you. Finally, the program has to be able to print out reports on the information you want.

When you shop for software, you will find that there are two basic types of data base programs — specific application and general purpose. Specific application data base programs are written to handle data on one thing. The Dairy Herd Improvement (DHIA) record program is an example of this. The DHIA program can only be used for the specific application it was designed for.

Usually these types of programs can be set up and in operation soon after purchase. What you see is what you get; you have little or no opportunity to customize any of the features in the package.

General purpose data base programs allow you to custom design the entire package for information storage from type, length and definition of data storage to report layout. The same general application program can be used to handle data bases for field records and for Christmas card lists. The price for flexibility is time spent in program design and development. This may not be a trivial matter for someone whose time is already fully committed.

General purpose data base programs come in two flavors — file managers and relational data base systems. The major difference between the two program types is in their ability to use information from more than one data file concurrently. A file management data base program can support many separate data files but only one may be in use at a time. A relational data base program can have two or more data files in use at the same time. A relational data base would be better suited to a situation where information in several files has a common bond. An example would be a dairy herd record system with separate data files for cow history, treatment, breeding and freshening. The common “link” between data files is the cow I.D. number. Once the number is entered, information from all related files can be accessed. Thus, entering the cow number could allow you to generate a report with the animal’s present condition, medical treatment history and breeding successes. Although all the information could be kept in one data file, the use of smaller, single-purpose files will allow faster data entry and processing. The cow history file might contain summarized information on key items from the other more detailed files.

Data Base File Structure

The entry of information into a data base implies that there is a structure or organization to the way in which that data are stored. With a specific application data base program, the organization is pre-set. A general purpose data base program allows you to determine the organization of the information. In either case, the program uses fields, records and files to manage the information. The following example illustrates the concept of a data base and the way the computer handles information in one.

Table 1. Example of records in a data base file.

Record	Fields				
	Name	Address	SSN	Position	Phone
#1	Smythe, A. L.	123 Elm	555-33-6872	Mechanic	777-6886
#2	Able, J. M.	789 Parkway	536-22-1234	Irrigator	767-1212

Data Base: A collection of one or more files of information. A filing cabinet which holds information on your business.

File: A collection of records. The filing cabinet has a collection of information in a drawer labeled “employees” that contains folders (records) on each employee.

Record: Information about a single item. The drawer labeled “employees” contains a folder with the record of “Smythe, A. L.”

Field: Any piece of information within a record. Each employee record has separate fields for name, address, social security number, position and phone number. The program might actually store the information as in Table 1.

The type of information that can go into each field generally can be one of three categories — **Character information** for a name or where the entry will not be manipulated mathematically (zip codes usually fall under this classification); **numeric** for numbers that will be mathematically handled and **logical** for entries that are either-or, true-false, in-out, etc.

The **width** of the field determines how many characters, including the decimal, will be allowed for data entry.

Tips on Setting up a Data Base

- Try to keep the field name only of sufficient length (3-4 characters) to enable a user to identify it. “Zip” works just as well as “zipcode” and is more efficient.
- When designing the data base, be sure to assign field widths large enough to handle the largest number of digits (including decimal point) or characters you anticipate. Excessive width will slow down data entry and computational time later on.
- Be sure to count the decimal point when determining field width. The number 45.31 would require a field width of 5; a maximum width of 7 would be required if the number 4531 were to be used in the same data base field. In many data base programs, field widths cannot be changed once the data base has been set up.
- Empty fields can be created to hold values calculated by the program.
- If the data base will be sorted as an array, an initial entry like NO (number) is necessary. As an exam-

ple, the first 50 records might be herbicides, the next 50 pesticides, etc. The name might differ, but it might be desirable for other items within the record to be the same and to be able to isolate on $NO \geq 1$ AND $NO \leq 50$. The NO field accomplishes this.

- If a field will be sorted to find records with like characteristics, be sure to make the entry exactly the same each time. Do not type "irrigator" and "IRRIGATOR" in the position field and expect the program to find both during a sort. There may be ways around this with some programs, but extra programming will be required to catch all cases of similar but not identical entry forms.
- Speed of entry versus sorting. If, as an example, one line is used to hold several pieces of information like the address (street, city, state, zip) entry will usually be faster. However, to sort for all records in the field ADDRESS = "BOISE," the program will have to examine all the information on the line to determine if BOISE is in the field. This can slow down the sort considerably in a medium or large data base. Personal preference and the number of other fields in a record should determine the approach taken.

Use of Operators in the Data Base

Nearly all data base programs allow the use of relational, logical and arithmetic operators to manipulate the data base information. These operators, when combined with program commands to sort, list, count, display or print, can give the user powerful means to find and use specific information in the data base.

Relational operators can be used for analyzing, searching and reporting data. They are:

<	less than	>	greater than
=	equal to	<=	less than or equal to
<>	not equal to	>=	greater than or equal to

Logical operators can be thought of as those variables or factors used to isolate on key characteristics with which you may have an interest. Is it this AND the oth-

er? Is it this OR the other? Is it this, NOT the other? Each of the terms may be used alone or in combination for inclusionary or exclusionary purposes. They are:

()	Parentheses for grouping
.NOT.	Boolean not
.AND.	Boolean and
.OR.	Boolean or
\$	Substring logical search operator

Arithmetic operators provide the means for making calculations within the program. Nearly all data base programs will support elementary algebraic operations. Some programs will allow more advanced math and or statistical operations as well. Mathematic operators include:

*	Multiplication
/	Division
+	Addition
-	Subtraction
()	Parentheses for grouping

Remember that, in most programs, mathematical calculations are performed from left to right, so improper parenthesis placement will give erroneous results.

Microcomputer data base programs can efficiently manage information for small businesses, homes and farms and ranches. With the proper software the microcomputer can become an electronic filing cabinet. If you select a data base program wisely and apply discipline to your data gathering, entry and verification, your computerized files will be able to provide the information you need in the form required to make good management decisions.

References

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