Microcomputer Statistical Packages
for Agricultural Research

by
Thomas C. Stilwell

Working Paper No. 17   **1984**

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MICROCOMPUTER STATISTICAL PACKAGES
FOR AGRICULTURAL RESEARCH

by

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PREFACE

There is a worldwide revolution in small computer technology underway and scientists are struggling to find ways to utilize this new technology to help solve development problems in the Third World. We are pleased to announce a number of papers on microcomputers in international agriculture will be published in our International Development Papers series. The aim of these papers is to provide timely information about the rapidly changing state of the new micro-processing technology and its use in research. The papers are also intended as guides to agricultural and social scientists on choosing, installing, and maintaining microcomputer hardware and software systems in developing countries.

Some of the papers will also document field experiences of selected established projects using new data processing hardware and software. Other papers will concentrate on developing guidelines for establishing and maintaining successful microcomputer and/or programmable calculator installations for agricultural research in developing countries.

The present paper is the tenth of these new papers. It is based on staff work by faculty members and graduate students of the Department of Agricultural Economics, Michigan State University, on cost-effective data collection, management, and analysis techniques for developing country applications. This paper has also been published by the North Central Computer Institute, University of Wisconsin, for distribution to member institutions. This activity is carried out under the terms of reference of Food Security in Africa Cooperative Agreement DAN-1190-A-00-4092-00, and previously under Alternative Rural Development Strategies Cooperative Agreement DAN-1190-A-00-2069-00, between the Bureau of Science and Technology of the United States Agency for International Development ;and the Department of Agricultural Economics at Michigan State University.

The author of this paper, Dr. Thomas Stilwell, has developed considerable experience in using microcomputers in agronomic research through his work with CIMMYT (International Maize and Wheat Improvement Center) and the Consortium for International Development in Bolivia. Dr. Stilwell is currently a Visiting Associate Professor at Michigan State University. He will be authoring other papers on microcomputers which will be published in our IDP series.

Readers are encouraged to submit comments about these new papers on microcomputers and to inform us of their activities in this area. Write directly to: Dr. Michael T. Weber, Acting Director, Alternative Rural Development Strategies Cooperative Agreement, Department of Agricultural Economics, Michigan State University, East Lansing, MI 48824-1039.

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Editors
MSU International Development Papers

Statistical Packages
for
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STATISTICAL PACKAGES FOR AGRICULTURE

For the purposes of this paper a statistical package is defined as a software package which computes any of the commonly accepted statistical tests over and above descriptive statistics such as mean, variance, kurtosis, skewness, max and min values. In practical terms this includes packages which compute an analysis of variance, t tests, regression, correlation, and related procedures. Although this definition may seem trivial, it serves to remove many packages from consideration. It is interesting to note that some packages not advertised as statistical packages have more statistical computing abilities than packages openly called "statistical packs".

Our consideration of statistical packages can be further simplified if we limit the list to those with an agricultural orientation. What is so different about agricultural statistics? In general it can be classified as being almost exclusively parametric in contrast to the social sciences which utilize many nonparametric statistical procedures. Agricultural experiments are often described by the experimental design used such as Randomized Complete Blocks, Latin Square or Split Plots. Statistical packages designed

for agricultural research utilize similar vocabulary and often provide analytical procedures preset for these standard designs. The presentation of printout from these packages also conforms to formats familiar to agricultural researchers rather than business or engineering researchers.

The total number of statistical packages for microcomputers is unknown. Over the last one and one half years Michigan State University has been engaged in a project to inventory all known microcomputer statistical packages. As of today we have a total of 216 packages or programs in our database with more being "discovered" daily. As shown in Figure 4, the majority of these packages are designed for non-agricultural applications.

Figure 1. Distribution of Statistical Packages by Field
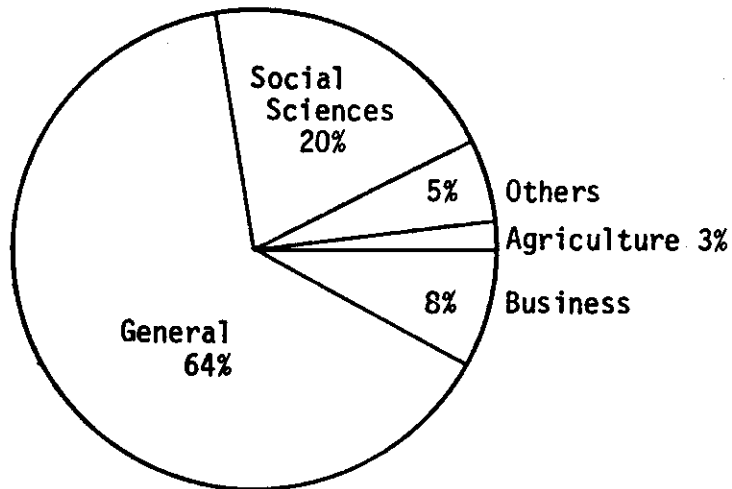
This raises the question of why there are so few statistical packages dedicated to agricultural research. It seems strange considering the fact that modern statistics was founded by an agricultural researcher. In fact the reason stems from two causes: the adoption of microcomputer technology and our old friend, economics. For some reason, the social sciences adopted

microcomputer technology much earlier than agricultural scientists. As a result a large number of the first computers were in the hands of social scientists. This fact alone generated a demand for software serving the social sciences. A second factor, the economics of software distribution and marketing, has favored business and the social sciences at the expense of agricultural researchers. Given the current level of microcomputer usage among agricultural researchers in the USA it is unlikely that a software producer could expect to market more than 100 copies of a statistical package per year. Assuming one package for each experiment station in the country plus individual purchases by researchers it is probable that the total market for agriculturally oriented statistical packages would not exceed 1000 copies. This is not enough to attract large marketing companies. Their attention is devoted to promoting packages which sell several thousand copies each year. As a result, almost no attention has been given to agricultural research by the commercial software producers. Unfortunately this situation is not likely to change in the near future.

Advantages and Disadvantages

Some researchers openly question the advantages of doing statistical analyses on microcomputers. Since there are established statistical packages available on mainframe computers, why go to the trouble of transferring to a microcomputer? It is helpful to review the advantages and disadvantages of using microcomputers for statistical analysis.

Advantages and Disadvantages of Microcomputer Statistical Packages

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Advantages	Disadvantages
Easy Access	Precision
Low Cost	Less Flexible Software
User Friendly	Limited Data Set Size
Data Security	No-Trial Purchase
Faster Data Processing	May be Hardware Dependent
Word Processor Interface	May have Copy Protection
Job Specific Software	Limited Product Support

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Advantages of Microcomputer Statistical Packages

Easy Access - The most important advantage of using a microcomputer is the extremely easy access for the user. Usually the microcomputer is kept in the researcher's office or in an adjacent office so that no more than 1 or 2 minutes are required to go from the desk to the computer. The actual time savings is not as important as the resulting increased use of statistical procedures. Frequently a researcher will develop a question or simply wonder What if..?. When the researcher has immediate (and free) access to a computer with statistical capabilities he is much more likely to actually test hypotheses or questions statistically than if faced with the time (and cost) of using a mainframe computer.

Low Cost - Most microcomputer statistical packages cost $200-400 and as such are much less than mainframe packages. For an individual researcher this low price usually means a significant savings over the cost of using a mainframe computer during one year. In fact, it is not uncommon to find research projects with several thousand dollars budgeted for mainframe computer time. In these situations a microcomputer can be purchased along with appropriate software and a net savings realized within the first year.

User Friendly - 'User friendliness' is a very mistreated phrase although it has definite value when comparing mainframe and microcomputer software.

Software written for mainframe computers is normally designed to be as 'powerful' as possible. This enables it to be useful to many researchers with widely differing analytical procedures. One of the concomittant problems which arises is that the difficulty of using a package increases with its flexibility. Because mainframe packages typically are so flexible, they are also difficult for the inexperienced user to operate. Microcomputer statistical packages tend to have less flexibility but are easier for the novice to use. Warning should be given here that not all microcomputer packages are user friendly. In fact, some are extremely unfriendly and the buyer must be wary of any claims to being user-friendly.

Data Security – The need to protect data is especially important for commercial research and is often a major reason for business purchases of microcomputers. When all data analysis is done in the office of the researcher there is less risk of data loss or theft than with many mini or mainframe systems. The use of diskettes permits the data to be physically locked up when not being used.

Faster Data Processing – The use of microcomputers often results in less total time being spent on data analysis as compared to using mainframe computers. Although the actual time spent doing a calculation may be greater for a microcomputer, the time spent in travel from office to a mainframe terminal is eliminated as are the repeated runs to correct errors in job setup. The result is less total time being spent on data analysis.

Word Processor Interface – Researchers frequently have to prepare reports of activities and must include tables of data and/or statistical results. Many microcomputer statistical packages include options of creating a disk file of results similar to that done on a printer. This file can then be combined

with reports prepared on a word processor, often on the same microcomputer. Total report preparation time is reduced and transcription errors are eliminated.

Job Specific Software - In contrast to mainframe statistical packages such as SAS or SPSS, microcomputer packages are often written with a specific use in mind. This results in a package which is not easily useable by all scientists but which is excellent for specialists in a limited field. If a researcher can find an adequate statistical package designed for data analysis in his field, it is almost always prefereble to generalized packages.

Disadvantages of Microcomputer Statistical Packages

Precision - Occasionally comments are made that microcomputers cannot calculate with enough mathematical precision to perform even common statistical calculations. Although this may have been true with the first micros, present day microcomputers generally can calculate statistical results to an acceptable accuracy. Admittedly they cannot provide precision to 32 decimals but very few researchers need results more precise than 3 or 4 decimals. For more demanding work requiring high precision, new algorithms have been developed which give impressive results on microcomputers.

Less Flexible Software - Because of limited memory and disk storage space, most microcomputer statistical packages are severely limited in the number and variety of statistical procedures that can be performed. Specialized packages are often the most limiting. Although they perform specialized computations adequately, slight variations in an experimental design may be impossible to analyze.

Limited Data Set Size - There may also be impractical limitations on the size of data sets that can be handled. Mainframe software often uses 'virtual arrays' which treat disk storage in a manner similar to active core data storage. This feature is very uncommon in microcomputers. The worst microcomputer statistical packages are limited to the amount of data that can be held in core memory at one time. Better packages depend on disk storage for data storage and even some calculations. Even in the best of packages, floppy disk storage is sometimes a limiting factor in the size of data set which can be handled.

No-Trial Purchase - Most microcomputer software must be purchased before the buyer can use or otherwise evaluate the product. Frequently the only source of information about a product is from the vendor who has a vested interest in emphasizing strong points and hiding fatal flaws. It is not uncommon to purchase a software package and find that it is totally inadequate for the planned application.

Hardware Dependent - Some software packages are written in such a manner that they can only be operated on one brand of microcomputer. This is especially true for specialized packages or older packages. If the researcher has repair problems with his computer there may be no way to transfer the software to another computer and continue. Most modern software has solved this problem and is quite 'portable' so that this is becoming less of a problem.

Copy Protection - An increasing number of microcomputer software packages are being sold with some form of copy protection. This discourages illegal duplication and distribution but also prevents legal and necessary creation of backup copies. If the vendor only supplies one copy of a protected software package, extreme precautions must be taken to prevent damage to that copy.

Product Support – In contrast to mainframe software vendors, most of the statistical packages sold for microcomputer use do not include any type of user support. If a researcher encounters problems or bugs during its use there is often no source of advice or assistance. Some of the widely distributed general statistical packages provide excellent user support, but the great majority of vendors do not come close to that level.

SOFTWARE CONSIDERATIONS

Once a researcher has decided to take the plunge and purchase a statistical package, many types of information must be gathered before making an informed purchase. The first step is to simply discover what statistical packages exist. This is not an easy task. The only known published listing to date (Kelly, et al, 1983) is a valuable aid in this search. Other sources include trade journals and software directories. Friends and colleagues also are a good source of information at this stage.

At this point the researcher will become aware of two facts about statistical software. The first is that most software packages have no real utility for agronomic research either because of the procedures included or the vocabulary used to describe the package. The second remarkable fact is that price has no relation to quality or features. Some of the better statistical packages on the market cost much less than packages having fewer features. High price normally indicates only that a larger amount of vendor support is included.

With a list of software names, the next step is to collect literature from vendors. This usually involves sending a letter asking for information. The resulting sales literature will further aid to remove undesirable packages from consideration.

The next step is to gather detailed information about the remaining statistical packages still in consideration. If a vendor offers the manual

for sale this should be purchased and read in detail. A telephone call to the vendor will usually uncover the name of a user in your area who can give opinions or even provide practice with the package in question. If unable to get detailed information about a desirable package it may be possible to purchase it with return privileges. Vendors are anxious to sell their product and often cooperate with potential buyers.

General Characteristics

There are several general characteristics of statistical packages which must be taken into account before considering other details.

Operating System/Language – Although the operating system and programming language of a package have little effect on its usefulness they greatly affect compatibility with other computers. Serious consideration should be given to using an operating system and programming language similar to that already in use by colleagues. In case of hardware problems this permits easy transfer to another computer. If the source code is supplied with the package it is sometimes desirable to make modifications permitting greater ease of use for a particular application.

Copy Protection – Some software packages utilize various schemes to prevent illegal copying. Unfortunately this also prevents the legal owner from making necessary backup copies. Copy protection is especially common in packages written for Apple computers. Copy protected packages should be avoided unless they have extremely desirable features. Even the most careful handling cannot prevent damage to diskettes and a resulting loss of software. Although backup copies can be purchased from the vendor it involves extra expense and time. There are also a few statistical packages which form copy protected data files. These should be avoided at all costs.

Menu Versus Command Driven - Menu driven software is normally considered 'user-friendly'. This type of software presents a menu of choices and the user selects one by pressing the indicated number or letter. Command driven software relies on the user to supply a letter or word often without any reminders supplied by the software. There are also various mixtures of these two extremes so that a clear classification of a package is not always possible. The principal advantage of menu driven software is ease of operation. Abundant explanatory information guides the user through each step. Its' major disadvantages include a lack of flexibility plus more time and keystrokes required to execute a given statistical procedure. Command driven software typically is flexible in the ways that procedures can be combined and normally requires fewer keystrokes to execute a specific procedure. Command driven software frequently permits batch processing. This feature involves storing a set of commands for a regularly used procedure to be stored on disk. By invoking the command file name an analytical procedure or series of procedures can be executed. The major disadvantage of command driven software is that it requires frequent reference to a manual. As a rule of thumb, if a researcher does not use a software package more than once every two months he should search for menu driven packages. If a package will be in weekly use then he can profitably invest in the greater learning time to gain the power of command driven software.

Portability - Portability refers to the ability to operate a software package on various computers. If a package is easily transferred to another computer then the researcher can expect to make use of it even if his equipment changes. Software which is dependent on a particular computer model becomes useless when that computer is sold or non-functional.

Error Trapping – Error trapping refers to the ability of the software to handle unexpected responses or results. Poorly designed packages have little or no error trapping and the slightest error on the part of the user can cause the program to 'crash' often with loss of time and data. Very few statistical packages are completely error proof because of the complicated nature of the calculations. One of the best examples in this respect is ABSTAT as reviewed by Pease, et al (1983). Unfortunately this package has little application for agronomic research. The only way to evaluate the error trapping ability of a software package is to make intentional errors during trial usage. If disastrous results occur then it should be given less preference.

Documentation – The documentation which accompanies microcomputer software is often the most neglected part of the software package. This is especially true for statistical packages. Unfortunately, many users do not appreciate the real inadequacy of their manuals until problems arise. Manuals for some packages consist of no more than 3 or 4 pages hastily put together to describe the package and its operation. If a package is remarkably easy to use and completely bug-proof then the average user will find little use for a written manual. We are still awaiting the introduction of such a statistical package. Most manuals utilize one of two styles; a tutorial or a users guide. The tutorial style assumes that the user will methodically go through the functions of the package with the manual at hand to learn how to efficiently use the procedures. Once this is accomplished, the manual can be placed on the bookshelf and occasionally opened for a refresher course. The users guide style assumes that the user will refer to the manual for only brief instructions when a problem occurs and it is organized to provide brief, concise information about procedures. Each style has its advantages and disadvantages. In actual practice the tutorial style is used infrequently

because very few users take the time to completely learn about a package before using it. The concise users guide is the more common style for microcomputers although many packages tend to be so concise that they are cryptic and of little value to the new user. When considering the purchase of a statistical package it is very advisable to purchase a copy of the manual first. This may cost $20-30 but can prevent the waste of several hundred dollars. At the very least the researcher can read in detail about capabilities of a packae and perhaps even gain an understanding of its style of operation, thereby rapidly narrowing the field of prospective packages to consider.

McGrann and Griffin (1982) outlined what they consider to be the basic requirements for a user manual. Clearly very few manuals meet these criteria but the closer a manual comes, the more useful it will be.

Minimum requirements for Users manuals .

1. A program title and statement of the programs objective and intended use.
2. The organization of persons to contact for user assistance.
3. The specifications for the necessary system hardware configuration to run the program.
4. An explanation of the methodology, formula, and variables used.
5. Information and guides on the input data and interpretation of output.
6. User procedures to run the program.
7. An example set of test data with a complete listing of inputs and results.
8. Relevant references to the subject matter.

Software characteristics

The consideration of software characteristics can be divided into two general areas; how the data files are managed and what type of results can be obtained.

Data file management

Data file management refers to the sequence of operations needed to create, edit or modify data contained in a file. As more data file operations are included in a package, the complexity of operating the package increases. Normally lesser capability for file management is associated with greater ease of use. It is necessary for each researcher to define his needs and look for software that can accomplish the desired functions with a minimum of complications. Suggested minimum features include data entry, data editing, transformations and calculation of new values.

Data Entry – The most important item in a statistical package is the method of data entry. Interestingly, this is the item most frequently ignored in vendor literature. A conservative estimate allocates as much as 50% of a users time for data entry and correction. The ease of data entry often determines whether a package is usable or not. A minimum requirement is that a statistical package be able to accept data both by keyboard entry or from disk files. The form of data entry is also important. For much agricultural research it is convenient to enter data in the same order as recorded in the field book (plot order entry). At other times it is more convenient to enter the data in order of the treatments used (treatment order entry). Ideally a package should permit both types of data entry. At least 5 decimals should be permitted in the data entry. A minimum of 200 plots and 20 columns of data is adequate for most applications although each researcher must give careful thought to their need for larger data sets.

Data File Editing – Once data has been entered from the keyboard or disk file it is necessary to edit the resulting file. The ease of editing a data file can have direct implications on how well a data set is reviewed for errors. A poorly designed editing function can discourage users from correcting all but the most obvious errors. The editing function is also very rarely mentioned in vendor literature and the only effective method of evaluation is by actually using the editing feature of a package. In addition to simple correction of data, it is frequently desirable rearrange the order of data columns or sort the file to a different sequence. A less frequently used editing feature is the addition or deletion of data rows and columns

ASCII File Interface – A feature found with the better packages enables the user to convert 'foreign' data files to the format utilized by the statistical package. This enables the researcher to receive data from a mainframe computer or another microcomputer for analysis and processing. The same facility should also permit the user to create data files useable by other computers. There are three standard file formats used for such transfers; DIF, SDI and ASCII. The DIF (Data Interchange File) format is promoted by VisiCorp and the SDI (SuperData Interchange) format is promoted by Sorcim. The most common method used is the ASCII (American Standard Code for Information Interchange) format. Nearly all packages with any provision for data file interchange will recognize an ASCII file format. A package with no provision for data file interchange should be given very low marks in an evaluation.

Transformations – The ability to perform transformations is essential to nearly all types of agricultural research. The ease of doing data transformation varies widely among packages. The most desirable method involves use of a menu to select preprogrammed transformations. A few

packages require the user to enter formulae for the transformation desired. The least desirable method utilized requires the user to actually enter program lines which calculate the desired transformation.

Selection of Subsets - While not frequently used in agricultural research it may be desirable at times to utilize a portion of a data set. An example is the analysis of only part of a factorial experiment data set utilizing the Randomized Complete Block Design. The ability to select part of a data set can be quite useful but is not a normal agronomic procedure.

Concatenation - Concatenation of data files refers to the joining together of two or more data files to form a new combined data file. This procedure is useful for combined analyses involving multiple locations or years. While manual methods can be used to circumvent the necessity for this feature it becomes very useful when dealing with larger data sets.

Statistical Procedures - The number and type of statistical procedures provided by a package is often the factor which convinces a researcher to make a purchase. It is desirable that a package have a variety of procedures as opposed to a few. Although the researcher will not utilize all of the features, they are available upon demand. If a package does not provide a variety of procedures then the researcher will tend to limit his statistical testing to those procedures present in the software. The more common statistical procedures which should be included in a package are:

```
ANOVA
     Randomized Complete Block Design
     Split Plot Design with up to 3 splits
     Factorial arrangements in RCBD with up to 3 factors
     Latin Square Design
Descriptive statistics such as mean, kurtosis, skewness, etc.
Mean separation procedures such as t test, DMR, etc.
Multiple Linear Regression for up to 10 independent variables
Ability to handle missing values in all procedures
```

Presentation of Results

Although the presentation of results is extremely important some packages give surprisingly little attention to the appearance of the printed results. A few statistical packages provide printed output that is barely coherent and requires study to simply understand what has been calculated. The better packages present results in standard formats and with adequate labelling so that interpretation and conclusions are unhindered. An additional desirable feature is the ability to create the same results in a disk file for use with a word processor. Easily understandable output and the ability to save this output in a word processor compatible file can make a statistical package the centerpiece in a computerized research system.

HARDWARE CONSIDERATIONS

There are many factors to consider in the selection of the specific hardware to be used for research data analysis. Although each situation calls for a different evaluation a few major points can be noted here. More complete information can be found in the many books which abound in local bookstores.

Local Service – The availability of local repair service is a major factor in selection of a brand of computer. The lack of adequate local repair service should effectively remove a brand from consideration.

Compatibility With Existing Equipment – If there is an existing installation of microcomputer equipment, serious consideration should be given to the purchase of equipment which uses the same disk format so that easy data file interchange is possible.

Mainframe Interface – The ability to interface with an existing mainframe computer should also be considered. If special equipment is needed this should also be included in the purchase plans.

Data Logger Interface – Although every researcher does not presently use electronic data logging devices, the number of users will certainly increase in the future. If there is any possibility of using this device to record data, look for statistical packages which provide an interface to accept data from a data logger. This may be included at no extra charge or involve exorbitant price differentials.

Numeric Keypad – The vast majority of microcomputers have a separate keypad for numeric input. This is essential for efficient data entry. If a particular brand of computer does not have a numeric keypad (such as Apple) then an external keypad must also be purchased.

KNOWN AGRICULTURAL STATISTICAL PACKAGES

What is an agricultural statistical package? The working definition used in this paper includes those which handle ANOVAs of experimental designs by names familiar to agronomists or which offer features designed to facilitate agricultural research. An example would be a package which offers analysis of variance for Split Plot Design experiments plus optional Duncan Multiple Range test.

There are many statistical packages which could be utilized to analyze agricultural research data and sometimes it is necessary to use these generalized packages because of the procedures included. However, many agronomists in practice utilize very few statistical procedures in their work. Their requirements for a statistical analysis package are relatively simple.

Features which are not used only add to the complexity of the package without increasing its' usefulness for the user.   Therefore it is valuable for most agronomic research applications to choose a statistical package which provides only frequently used statistical procedures.   Rarely used procedures only serve to add unnecessary complexity during normal use of the package.

The table which follows includes all known statistical packages expressly designed   for   agricultural   research   or   which   could   be   classified   as agricultural statistical packages.

Known Agricultural Statistical Packages
===
```
          ANOVA for Apple
          Herbicide Evaluation Manager
          Herbicide Research Manager
          MSTAT
          MSUSTAT
          SAE
          SpeedStat
          Stadt
          Statistical Analysis Package
```
===

The above list is necessarily incomplete.   This information is difficult to accumulate because there is no public source of information such as directories or magazines for agricultural software.   Much has been documented through personal contacts.   It is hoped that this paper will encourage software authors to make their package availability known so that this list will expand greatly over the next few months.

Descriptions of Statistical Packages for Agriculture

The   following   descriptions give a brief summary of some key characteristics of each package.   There is no attempt to include all features of a package in each description.   This information is only intended to help researchers narrow down their list of packages for consideration.   More detailed information can then be obtained from the vendor and users.

ANOVA for Apple

Vendor: Dr. P.S.C. Reddy   Price: free
        1532 Briarrose Drive
        Baton Rouge, LA   70816
            tel. (504) 766-8790
Operating System: Apple DOS
Equipment needed: Printer, one disk drive
Copy Protected: No
Manual: no information
Description

        ANOVA for Apple was originally publicized as costing $99 during the
1983 ASA meetings but the authors have recently decided to release it to
the public domain.   It features data entry and editing with experiment
titles and subtitles.   Results include ANOVA, treatment means, F values,
significance levels and LSD values.   Experimental designs included are
Completely Randomized Design, Randomized Complete Block Design (up to 2
factors) and Split-Plot Design (up to 2 factors).

Herbicide Evaluation Manager

Vendor: American Agricultural Services   Price: $1000+
        1142 East Maynard Road
        Cary, North Carolina   27511
            tel. (919) 469-1800
Operating System: TRS DOS
Equipment needed: TRS 80 Model II
                  64K RAM
                  Disk Expansion Unit
                  Printer
                  Optional Datamyte and modem
Copy Protected: no information
Manual: no information
Description

        The basic price of the Herbicide Evaluation Manager is $1000 but
with the addition of a Datamyte interface and communications interface the
total price rises to $2000!   Data entry can be by keyboard or through an
optional Datamyte data logger interface.   Specialized calculations are
performed for herbicide trials including mixing labels, randomization and
printed mixing instructions.   The package also maintains data files of
herbicides, weeds and crops for report generation purposes.   Statistical
results include Randomized Complete Block Design ANOVA, treatment means,
and LSD.

Herbicide Research Manager

Vendor: Gylling Data Management   Price: $700
        101 Normandy Village
        Brookings, SD   57006
            tel.
Operating System: MS-DOS, TRS DOS
Equipment needed: IBM PC or TRS-80 Model III
Copy Protected: No
Manual: no information
Description

        The Herbicide Research Manager has the option of adding the Duncan
Multiple Range test for an additional $75.   Data entry is done via a full

screen editor or from a data logger. Experiment preparation functions include treatment randomization, mixing instructions and data recording sheets. Data file management functions include the calculation of new variables or data columns to permit averaging, conversions, transformations, etc. Results include Randomized Complete Block Design ANOVA and Duncan Multiple Range test with missing plot calculations included. All results can be produced on a monitor or printer.

MSTAT

Vendor: MSTAT   Price: $100
Dept. of Crops & Soils
Michigan State University
E. Lansing, MI   48824
Operating System: MS-DOS, CP/M
Equipment needed: 64K RAM
                  Printer
                  two disk drives
Copy Protected: No
Manual: 300 pages
Description
    MSTAT is a menu driven general purpose statistical package for agricultural research. Data entry is by keyboard. Experiment preparation functions include treatment randomization, printing of data forms, field map printing and label printing. Lattice and Randomized Complete Block Design ANOVAs are identified by name and other factorial experiments are analyzed by a generalized ANOVA. Missing values can be automatically calculated in most of the analytical routines. Other procedures include regression, correlation, descriptive statistics, hierarchical ANOVA, and nonorthogonal ANOVA. Any number of plots can be included in the data file with up to 100 data items per plot.

MSUSTAT

Vendor: Dr. Richard E. Lund   Price: $500
Statistical Center
Montana State University
Bozeman, MT   59717
    tel. (406) 994-3271
Operating System: CP/M
Equipment needed: no information
Copy Protected: No
Manual: 120 Pages
Description
    MSUSTAT is a command driven generalized agricultural statistical package. Data entry is by keyboard. Different data entry formats may be required for different analyses. Missing values are not permitted. Results include ANOVA for Completely Randomized Designs, Randomized Complete Block Designs, Factorial arrangements with up to 4 factors, data transformations, multiple linear regression, histograms, and descriptive statistics. Many other statistics and procedures are included but not listed here.

SAE

    Vendor: James A. Garcia   Price: no information
            Calle 32 No. 36-05
            Palmira
            Colombia
    Operating System: Apple DOS
    Equipment needed: Apple II plus
                   TRS-80 Model 16
                   NEC 8000
    Copy Protected: no information
    Manual: no information
    Description

        SAE stands for Sistema Estadistica Agricola and is for Spanish speaking agricultural researchers. Data entry is by keyboard in any order desired for up to 100 treatments per replication. Experimental designs and tests included are Completely Randomized Design, Randomized Complete Blocks Design (with 3 factor factorial), Split Plot Design, Split Block Design, Latin Square, Duncan's Multiple Range test, LSD and regression. Bar charts can also be produced on the monitor or printer.

SpeedStat

    Vendor: SoftCorp International   Price: $250/vol
            229 Huber Village Boulevard
            Westerville, Ohio 43081
               tel. (513) 891-5044
    Operating System: Apple DOS
    Equipment needed: 48K RAM
                   2 disk drives
    Copy Protected: Yes
    Manual: no information
    Description

     SpeedStat is actually a series of packages. SpeedStat 1 is a menu driven data entry/editor program which also includes descriptive statitistics and missing value calculations. SpeedStat 3 includes balanced design ANOVA procedures for Completely Randomized Designs, Randomized Complete Block Designs, Split Plot Designs and Latin Square Designs. Hierarchical or factorial arrangements can be accomodated with fixed or random effects having up to 6 factors. Data sets can have as many as 2048 plots, each with up to 128 items of data.

Stadt

    Vendor: Dr. Alvin J.M. Smucker   Price: free
            Dept. Crops & Soil Science
            Michigan State University
            E. Lansing, MI 48824
               tel. (517) 355-8370
    Operating System: Advanced BASIC
    Equipment needed: HP 9845B
                   Graphics
    Copy Protected: No
    Manual: 3 pages
    Description

        Stadt is a menu-driven package. It can handle 500 plots of data and will calculate ANOVA for Completely Randomized, Randomized Complete Block and two/three factor (with or without splits) experimental designs and

Linear/Multiple regression. Mean separation (LSD, Duncans MR) and standard deviation are also calculated. Results can be printed as a data table and in a graphical format.

Statistical Analysis Package

Vendor: Dr. J.J. Hammond   Price: no information
      North Dakota State University
      Fargo, ND   58105
        tel. (701) 237-8011
Operating System: Apple DOS
Equipment needed:
Copy Protected: no information
Manual: no information
Description

The Statistical Analysis Package seems to be a mixture of command driven and menu driven software. Data entry is by keyboard. Data file operations include sorting, file merging and case deletion. Experiments can also be randomized to assist in experiment planning. Results include Lattice design ANOVA, Randomized Complete Block Design ANOVA, Split Plot ANOVA, correlation and regression.

SUMMARY AND CONCLUSIONS

This quick overview of agriculturally oriented statistical packages for microcomputers illustrates that the sale price of a package has little relation to features or usefulness. Potential purchasers should evaluate their needs before looking for specific statistical packages. Careful consideration of software data file management abilities, statistical procedures and quality of output are essential. Vendor literature is often of little help to discover what functions a package is capable of performing. If possible, the researcher should actually use a package to evaluate its' usefulness.

There are certainly many more agricultural statistical packages in use than have been mentioned in this paper. Agricultural researchers are urged to contribute information about these packages so that they may become more widely known.

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