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A COMPARISON OF DATA BASE MANAGEMENT PROGRAMS FOR THE APPLE, TRS-80, AND CP/M MICROCOMPUTER SYSTEMS

by

Robert D. Stevens

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Data Base Management Programs (DBM) or Data File Management Programs for microcomputers have three central functions: (1) Data (alphanumeric) entry and editing, (2) data sorting and searching and (3) printing data (See Table 1). These programs range in price from free (public domain) such as File Cabinet for the Apple II to over $1,000. Ease of use and flexibility in functions are major issues. For example, it is much more desirable to be able to create one's own data entry format (file template). Also the amount of flexibility in formats for printed output is usually important. A general issue of considerable importance is whether the data files generated are in a standard format so the data may be transferred for use in other programs; or at least, that the DBM program can translate its files into a standard format for use elsewhere. Once a lot of data has been entered into one DBM program, you're stuck if you want to use the data with another program, unless costly data reentry is undertaken. One current effort to make data transferable between programs is to use the DIF data Format - see Visifile. Bill Brown has provided an overview of DBM software which follows.

These notes on comparisons of what appear to be important characteristics of DBM systems were developed primarily based on The Book of Apple Software, 1982, and Byte, November, 1981.

Those listed in the comparison were judged to be the main contenders for top performance from among those identified, except that information on Maxi Manager and AIDS III with CALS (See Appendix 2) was not available in time to review. Blanks in the table indicate information was not found.

INFORMATION AND DATA BASE MANAGEMENT SOFTWARE
-- A GENERAL OVERVIEW --

by Bill Brown, Computer Laboratory, MSU

Data Base Management Systems (DBMS) are a type of computer software that is largely responsible for the ability of the computer to take over much of the filing and record keeping that has traditionally been done with pencil and paper.

A data base is a collection of information and can be almost anything that can be expressed in letters and numbers: name and address lists; bookkeeping and acounting data; bibliographies; customer lists; appointment calandars; data from research studies, etc.

Much information stored in data bases is most useful to people when it is printed on paper. Why not just stay with paper and pencil methods? In many instances it is simpler and less work to do so. A DBMS becomes more valuable when the amount of information is large, when it must be modified frequently (and new printed copies made) and when the data base contains information that can be selectively used for many different purposes.

For example, a data base consisting of information about people might store names and addresses, phone numbers (home and work), birth dates, skills and knowledge possessed by them, what kind of computer and equipment they have, etc. In one instance we might want a simple and compact list of names and phone numbers, sorted alphabetically by last name. In another we might want to print a set of mailing labels, sorted by ZIP code, or a list of names and birth dates sorted by date, in the order birthdays will occur during this year. Any given "report" we get from the data base might include only part of the people on the list or part of the information stored for each person. DBMS software of modest capabilities should allow you to do all of this.

There is an amazing variety of DBMS programs on the market for micros. They range in price from less than $50 to over $1000. Generally, the price speaks for quality and capability, but not always. Shop with your needs in mind; there's no point in paying for elaborate capabilities you won't use.

You can get specific programs for the applications ideas mentioned above, as well as others, that are essentially customized data base programs. The more general (or generic) DBMS programs will allow you to do many of the same jobs with one software purchase. DBMS software allows you to define the structure, content and use of data files, without having to write computer programs. In some instances these can be made to look and function like specific applications programs.

The ease with which this can be done varies from program to program: the "user interface" may be excellent or very poor and can make all the difference in the willingness with which you approach new applications or the on-going maintenance of existing data bases, or your ability to modify and use them.

The process of defining a new data base usually requires a fair amount of planning, varying with the complexity of the data and the facilities of the program. Capable programs will allow you to modify definitions already made, so that you don't have to start from scratch if you have a new idea or are reminded

of an overlooked requirement. The better programs will also allow you to reorganize and restructure the data base, even after you have stored some data in it.

There is a type of software becoming widely available now called "program generators". These take input from a user/programmer and produce stand-alone, ready-to-run programs for specific purposes. They excell in data base type applications and might be thought of as elaborate user interfaces to a DBMS. They have the disadvantage that you must keep a separate program, in addition to the data base, for each application. And there is always the possibility that you will find uses for the data base that you did not plan into the program.

Data base organization and structure: Most data bases will consist of "fields", "records" and files. The fields for a mailing list data base might be: NAME, STREET ADDRESS, CITY/STATE/ZIP. The information for each person (all fields) is grouped into a record. The records for all people are grouped into a file.

Field types: Almost all DBMS programs will allow you define field types of: integer numeric, decimal pointed numeric and text. Usually you must specify a fixed, maximum lenght to be used for any given text field. Limited field widths generally make DBMS systems of marginal usefullness in managing text files. There will probably be some maximum number of fields that can be defined within one record. More cabable systems may provide specialized field types like: date, time, phone number and Social Security Number, along with special processing capabilities and data input checking for them.

Records: There will usually be some maximum number of characters allowed for each record, allowing you to use a few long fields or many short ones. Records may be organized in the file in many different ways: order of entry; sorted (or indexed) by the value of one or more fields, possibly with several indexes that can be used to access records at different times.

File access: Some micro based DBMS programs operate with the total file in memory; these are limited to usefulness on small files. More capable programs load only the protion of the file that is needed at any given time and update the files on disk after each new record is added or existing record modified. The disk access time reduces the speed of operation, but is almost essential for complicated or large applications. Some files are stored and accessed sequentially, making it necessary to read through the whole file to find a specific record -- this may be fine for small files or ones maintained in memory, but should otherwise be avoided. More desirable is for the program to be able to retrieve a specific record from the file based on indexes maintained for the file.

Most micro based DBMS programs permit file that are limited in size to the amount that can be stored on one diskette. Some will span a file across diskettes, which will allow larger files, but may complicate using the program -- frequent swapping of diskettes, with the possible confusion and errors that can result. The latter problem can be alleviated somewhat with more disk drives.

Multiple file data bases: Some systems allow a data base to contain several files that are realted in some way. Such structures can be what are called

"hierarchical" or "relational" data bases. Such systems are more advanced than many micro users need and push the capabilities of the computer because they require more processing and are memory consumptive.

DBMS functions: Create, Update (delete, add, modify), Select, Sort, Report.

Create: Define the structure of a completely new data base or create a new one from all or part of an existing data base. There may be capabilities to start a new, empty data base that has the same structure definition as another. The ability to resturcture data bases is an linked to this capability and is a very desirable feature -- it keeps you from having to start over when the needs of the application change. Sometime a new file may be created by merging several existing ones.

Data input assistance: Some programs allow the file definition to contain information about allowable data values, so the program can check data while it is input. Some allow default values to be filled in automatically for a field, which can later be modified, or may carry the field value from a previous record to the new one -- e.g., city or state name when entering data from on locale. The capability may be provided to automatically calculate some fields from data input to others.

Data input forms: fill-in-the-blank questionnaire formats are defined by the user and displayed on the screen during data entry. A form might span several pages (screens) to support data entry for the entire record.

Update/select/scan: Data bases can be updated by adding new records or by deleting records or modifying selected fields in existing records. This may be incorporated with a feature that allows you to selectively scan the records, by moving through the file sequentially or choosing records based on the content of one or more fields. Some DBMS programs allow you to make global changes in data file -- for example, subtract or add a value to a field for all or part of the records. Avoid "scan" functions that limit you to selecting records by references to a single ID field or record number field.

Sorting: Permits reordering the records for easier scanning or for producing reports or creating new data bases. Records are sorted numerically or alphabetically based on the contents of one or more fields. Sorting routines written in BASIC are very slow and should be avoided.

Reporting features: The flexibility to easily produce varied report formats will probably account for the cost differentials of many DBMS programs. Most programs limit report formats to columnar tables, with each row containing information form one record or reports that allow several lines per record. More capable programs will allow values that are calulate from the data base to be output in reports: subtotals and totals, via simple arithmetic or complicated algebraic formulas. Some report programs will also allow a subset of the records to be selected for a specific report. Many programs provide some standard report formats, like mailing labels.

Interfacing with other programs: Some systems are capable of producing output files that can be used and input to other programs, for example, extracting a selected list of names and addresses for use in personalizing many copies of a

form letter being produced by a word processing program.

Telecommunications: Some DBMS programs have built-in capabilities to allow you to transfer files to other computers.

Bill Brown -- MSU Computer Laboratory

TABLE 1

COMPARISON OF FUNCTIONS OF DATA BASE MANAGEMENT SYSTEMS
USING INSTRUCTIONAL MANUAL TABLES OF CONTENTS
- DATA ENTRY, SEARCH, SORTING AND PRINTING

VISIFILE	VISIDEX (Electronic Index Card)	DATA FACTORY	D B MASTER
Introduction	Introduction	Introduction	Introduction
Main Menu Tutorial Lesson 7 Sample File and sample report	Initial Visidex Screen	Ch. 1 Start a Data Base Ch. 2 File Information	
-DATA ENTRY, CHANGE AND DELETION			
L. 2 File Maintenance; Add, delete, etc. L.3 Creating a File Template format, defining fields, etc. L.4 Backing up + Copying files	Tutorial-Lesson 1 Editing Screen-text. L.3 Basic Screen editing L.4 Screen, Storage + Retrieval L.5 Cross-References. L.6 Data Templates L.7 Calender screens & Key-dates.	Enter Data-screen format 6. Inspect-change 7. Update 8. Replace 9. Transfer 10. Construct/ Append 18. Delete	Part I, Ch. 1, Building a file Tutorial 1. Screen Formats T2. & T3. Creating a file Ch2 Adding records Ch5 Opening and closing files Ch6 Short forms
-SEARCH			
	L2 Creating Key-words (for files + searching)	Ch.11 Search Ch.12 Level Search Ch.13 From/to	Ch.3 Finding and Displaying records Ch.4 Printing + editing T.5 Search + edit
-SORTING + INDEXES			
L6 Sorting + Indexes		Ch.14 Sort Ch.16 Compare Ch.17 Index	Ch.4 The Sort Sub-format Ch.5 Select sub - format + master format T.8 Sort + select formats

VISIFILE	VISIDEX	DATA FACTORY	D B MASTER
- PRINTING			
L.5 Printing reports & labels	L8 Printing L9 Applications Directories, abstracts + indices	Ch.4 List-Print Ch.5 Printing formats	Part II Ch.1 report formats Ch. 2(T.6) Page formats Ch.3 (T.7) Data formats Ch.6 Printing a report T9 Mailing labels
-OTHER			
L.7 Using Computed fields L.8 Reorganizing Data Base-Create New Files L.9 Special Functions transfer a file -DIF, Custom screen map Ch.3 reference -Error Messages	Ch3 Command reference	Ch.15 Math Ch.19 Initialize a disk Ch.20 Disk space Ch.21 Select another file Ch.22 Applications Ch.23 Error handling	Part III File maintenance
APPENDICES			
B Data Formats, records + file definition	A. Printing B. Error Messages C. Equipment D. 101 Ways to use Visidex		Error Messages
-COMMENTS			
Has pocket reference card	Has pocket reference card		

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TABLE 2 DETAILED COMPARISONS OF 12 DATA BASE MANAGEMENT PROGRAMS AND SOME NOTES ON THEIR CHARACTERISTICS[c/d]

NAME	APPLE						TRS-80 [b]			CP/M		
	VISI-FILE	VISI-DEX	DATA-DEX	DB MASTER	DATA FACTORY	INFOR. MASTER	DATA MANAGER	PROFILE	PROFILE II	FSM-80	SELECTOR IV	TIM
Cost $	250	190	250	230	150	150	49	80	179	750	550	400
Special Hardware?		2 Drives Recom.		2 Drives Recom.			Mod I?	Mod. I & III	Mod.II	CP/M	CP/M	CP/M
Manual Length PP.				116	24			29				
Language	A	Machine	A	A + Machine	A	A		Mach.	Mach.	Mach	CBASIC	MBASIC
Standard DOS		N	Y									
Data Files can be used w/other programs	Y with 2 Drives											
Max File Size	1 Disk	Unlim	Unlim	Unlim	1 Disk	2 Disks	4 Disks	4 Disks	4 Disks	16	Comb.	Comb.
Fields per Record	24	?	50	100	239	20		153				
Max Field Size	38	?	36	30	239	99		255				
Max Record Lgth.	232	?	239	1020	21,032	1980		255				
User a Programmer		N	N?	N?	N	N	N	N	N	Y	Y	Y
Evaluation[a]												
Ease of Use	87	85	80	80	85	85						
Vendor Support	85	85	80	85	85	80						
Documentation	90	90	80	85	87	85						
Price/Use	85	85	80	93	90	80						
Visual Appeal	N/A	N/A	80	85	N/A	90						
Reliability	85	90	85	85	90	95						
Error Hand.	88	90	85	85	95	95						

[a] From The Book of Apple Software, 1982

[b] See attached information on Maxi-Manager

[c] See also list at end.

[d] Considerable effort was made to assure accuracy in these tables, errors may have crept in, blanks indicate information

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	VISI-FILE	VISI-DEX	DATA-DEX	DB MASTER	DATA FACTORY	INFOR. MASTER	DATA MANAGER	PROFILE	PROFILE II	FSM-80	SELECTOR IV	TIM
General Characteristics of Program												
Error Recovery or Crash						E.Rec	Crash	?	?	E.Rec	E.Rec.	E.Rec
Programming Lang. Interface						Y		Y	N	N	N	Y
Explains File Organization						N	Y	Y	N	Y	N	Y
Sequential Access to Files only												
Data Entry and Management												
User Templates for Data Entry	Y	Y	Y	Y	?	N	N	Y	Y	Y	N	N
Maintains Data in Sorted order						Y	N	N	Y	Y	Y	Y
Auto. Entry of Default Values												
Max. # of Fields or Fixed						20	10	153	-	255	80	24
Combine Files and/or Subfiles						N	N	N	N	Y	Y	Sub Y Comb N
Can Reorg. Data (Insert Fields, etc.)												
Characters not allowed in fields												,
Multi-Record update					Y	Y	N	N	N	Y	Y	N

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	VISI-FILE	VISI-DEX	DATA-DEX	DB MASTER	DATA FACTORY	INFOR. MASTER	DATA MANAGER	PROFILE	PROFILE II	FSM-80	SELECTOR IV	TIM
Selection Criteria used for Global Updates						Y	Y	N	N	Y	Y	N
Criteria for Record Selection (Sorting + Searching)												
Sort by Mach. Lang.								Y				
Selection by I.D. Only								N				
Complex Nested Conditions						Y	N	N	N	Y	Y	Y
Max # of Conditions	10				20	6	-	1	-	No.Lim	10	?
Range	Y	Y				Y	Y	N	Y	Y	Y	Y
Sub-String	Y			Y		Y	N	Y	Y	Y	Y	Y
Nothing, Null Value	?				Y	Y	N	N	N	Y	Y	Y
Predefine Selection Criteria	Y?					Y	N	N	Y	Y	Y	Y
Report Writing												
Rpts can be written to file		Y on Disk 2				N	N	N	N	Y	N	N
Rpt format, predefined		Fixed by Entry				Y	Y	Y	Y	Y	Y	Y

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Max Number of predefined rpts.					10	15	?	1	5	255	?	?
Prints Labels	Y	Y	Y	Y	Y	N						
Formatting Reports				Difficult								
Control Col. Widths						Y	N	Y	N	Y	?	Y
Text Inserts						Y	N	N	N	N	?	N
Margin Control					Y	Y	Y	N	Y	Y	?	Y
Print Sample Record						N	N	Y	N	Y	?	Y
# Lines Skipped Between Records						Y	N	N	N	Y	?	Y
# Characters Between Records						N	N	N	N	Y	?	Y
# Records Across Page	5					N	N	N	Y	Y	?	Y
# Lines per Records						Y	N	N	Y	Y	Y	Y
Break Points for Summaries		N	Y	Y	Y	Y	N	N	Y	Y	Y	Y
Subset Record Selection												

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Derivation of New Data for Rpts.												
Sums	Y	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y
User Defined	Y				Y	Y	N	N	N	Y	Y	Y
Column from 2 Other Columns						Y	N	N	N	Y	Y	Y
Record Numbering						Y	N	N	Y	Y	?	?
OTHER COMMENTS	Replaces CCA DIF files Flexible Formatting	Index Card System Calendar Emphasis No Manipulation of record data?	Not as flexible as others	Needs DB Utility pack. Each file needs 2 disks Most power, complex, slow, many disks.	Can Output to 80 col. boards Was "mini factory" See also feelings II July-Aug. 1981, p. 45	Old + Slow						

A LIST OF OTHER DBM PROGRAMS

CCA - Earlier version of Visifile now out of date? $99, price/use ratio 81, see The Book 1982 + Byte, Nov. 1981, p. 212 ff. (See attached ad.)

Information Master (used with Data Master $) - Old and slow $150, price use ratio 80, see The Book 1982, and Byte, Nov. 1981, p. 212 ff.

Modifiable Data Base (New Version Data Reporter?) $80, price use ration 75, see The Book 1982.

Micro-conductor - $400, no user templates, user needs to be a programmer, see Byte, Nov. 1981, p. 212 ff.

CIF - $39 capacity 1 disk, does not produce labels. See The Book 1982, p. 98.

Data Handler - $25, no user templates, user must be programmer. See Byte, Nov. 1981, p. 212 ff.

Micro Info Systems - $100, no user templates, user must be a programmer, see Byte, Nov. 1981, p. 212 ff.

Data Manager (Apple) - $49, ease of use 50, vendor support 80, documentation 60, price/use 50, visual appeal 60, reliability 50, error handling 50 (DM also produces mailing lists. Program in Machine Language [See The Book, p. 101])

Maxi Manager (TRS-80 Model 1 & 3) - $99, looks like a contender. Information came in too late (see attached Ad).

File Master - $119, (Apple) Uses File Cabinet files.

File Cabinet (Apple) - Free-Public Domain. Slow and limited.

Radex (TRS-80 Models 1 & 3) - $99, Information cam in too late, see attached ad.

AIDS III with CALS (TRS-80 Models 1 & 3) - $95, Information came in too late, see attached ad.

PFS: Personal Filing System - $99 price/usefulness ratio 85, plus PFS: Report - $99 - price/usefulness ratio 80. See The Book of Apple Computer Software, 1982, p. 90 & 91.

Condor - $695 Leighton Price has a manual, relational DBM System, Z80 machine language.

Data Star - works with the word processor Word Star (CP/M), Leighton Price has a manual.

FMS-80. CP/M, $750, machine language. Leighton Price has a manual.

Maxi Manager

The fine: Data Base Manager Available

DATA MANAGEMENT PROGRAM COMPARISON CHART

	CCA DATA MANAGER	ALOS III W/B CALC	MAXI MANAGER	RADIX 16	PROFILE
FILE CAPACITY & FORMAT					
Maximum # of disks per file	1	1	4	31	4
Maximum # of records per file	2450	Note 1	32,767	10,199	65,535
Maximum record length	249	254	800	255	255
Maximum # of characters per field	249	254	40	254	255
Maximum # of fields	24	20	20	127	153
Maximum # of characters per field label	15	10	19	12	765
Variable length records (pack sectors)	No	Note 2	Yes	No	No
FIELD TYPES					
Alphanumeric	Yes	Yes	Yes	Yes	Yes
Numeric	Yes	Yes	Yes	Yes	No
Fixed decimal numeric	Note 4	Yes	Yes	No	No
Date (MM/DD/YY)	Yes	No	Yes	No	No
Extended date (MM/DD/YYYY)	No	No	Yes	No	No
Calculated equation	Note 5	Note 6	Yes	No	No
Permanent fields	Yes	No	No	No	No
SORTING					
Machine language assisted	No	Yes	Yes	Note 7	Yes
Sort by any field	Yes	Yes	Yes		Yes
Number of Sort Key files	1	1	5		1
Numeric sort	Yes	Yes	Yes		No
Ascending sort	Yes	Yes	Yes		Yes
Descending sort	Yes	Yes	Note 11		Yes
Sort within a selected range	No	No	Yes		No
Sort multiple fields simultaneously	Yes	Yes	No		No
FILE MAINTENANCE					
Fixed length input fields	Yes	Yes	Yes	Yes	Yes
Single key entry of common data	No	No	Yes	No	No
Single field EDIT selection	Yes	Yes	Yes	Yes	Yes
Skip record (next or previous)	Yes	Yes	Yes	No	Yes
Search & EDIT record	No	Yes	Yes	No	Yes
Search & DELETE record	No	Yes	Yes	No	No
Auto rejection of alphanumeric data in numeric field	Yes	No	Yes	No	No
RECORD SELECTION TECHNIQUES					
Record number	Yes	Yes	Yes	Yes	No
Binary search (high speed)	No	No	Yes	No	No
Maximum # of simultaneous keys	1	4	10	31	1
RELATIONAL COMPARISONS					
Equal	No	Yes	Yes	Yes	Yes
Not equal	No	Yes	Yes	No	Yes
Greater than	No	Yes	Yes	Yes	Yes
Less than	No	Yes	Yes	Yes	Yes
Instring	Yes	No	Yes	Yes	No
AND / OR	No	No	Yes	Yes	No
Wild card masking	No	No	Yes	No	No
PRINTING					
User specified page title	Note 8	Yes	Yes	No	Note 10
User specified column headings	No	No	Yes	No	Yes
Automatic page numbering	Yes	Yes	Yes	Yes	Yes
Right justification	No	Yes	Yes	No	No
User defined column widths	Yes	No	Yes	Yes	Yes
User defined column separators	No	No	Yes	No	No
Keyboard entered columnar values	No	No	Yes	No	No
Merge data into form letters	No	No	Yes	No	No
Form filling applications	No	No	Yes	No	No
Columnar totals	Yes	Yes	Yes	No	No
Columnar subtotals generated upon change in a specific field	Yes	Yes	Yes	No	No
Built in screen print	No	No	Yes	No	No
MISCELLANEOUS					
Cost	$75.00	$94.95	$99.95	$99.00	$79.95
Punctuation allowed within data fields	Yes	?	Yes	Yes	Yes
Upper / Lower case	Note 3	Note 3	Yes	Note 3	Note 3
Built in RS-232-C driver	Note 3	Note 3	Yes	Note 3	Note 3
Built-in TRS-232 driver	Note 3	Note 3	Yes	Note 3	Note 3
Programmer's interface	Note 9	Note 9	Yes	No	Note 9
Sample DATA disk	No	No	Yes	No	No
Documentation (# of pages)	?	?	120	38	29

NOTE 1 File size is dependant on memory size.
NOTE 2 Sequential files only.
NOTE 3 User must apply own driver routine.
NOTE 4 Hard copy print out only.
NOTE 5 Four functions (+ - * /) only.
NOTE 6 Same as note #5 with a maximum of two calculated fields.
NOTE 7 Available as a separate program for $99.95.
NOTE 8 120 character maximum.
NOTE 9 Data structures defined in manual.
NOTE 10 132 characters maximum.
NOTE 11 User option (files can be read from ascending or descending order).

The jury is in and the verdict is . . . "outstanding!" Reviews from all of you who purchased MAXI MANAGER (not to mention raves by many top microcomputing magazines) have heralded it as the definitive data base managing system. We knew that business owners and hobbyists demanded the finest data base managing system available. To all of you who praised us for MAXI MANAGER, we extend our thanks. And to those of you who have yet to try MAXI MANAGER, we invite you to experience this incredible system today. But don't take our word for it (or our jury's). Judge for yourself.

JUST CHECK SOME OF THESE FEATURES

- Supports six different relational search techniques.
- Comes with programmer's interface.
- Over 120 pages of documentation.
- Supports up to 20 user defined fields of 40 characters each.
- Record length up to 800 characters.
- Files can be up to four disks in length.
- Compatable 35, 40, 77 & 80 track drives with proper operating system.
- Has calculated equation fields.
- Complete report generator.
- Works hand in hand with any word processor.

MODEL 1 version requires TRSDOS 2.3 and is compatable with NEWDOS 2.1 & NEWDOS 80

MODEL 3 version comes on TDOS, a special version of the DOSPLUS operating system.

Requires 48K of RAM and one disk drive minimum.

For the TRS-80 Model 1 & 3
Order No. 012-0096

$99.95

Adventure International • Box 3435 • Longwood, FL 32750
TOLL-FREE ORDER NUMBER: (800) 327-7172
A Division of Scott Adams, Inc.
IN FLORIDA (305) 862-6917
SHIPPING AND HANDLING CHARGES ARE EXTRA
PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

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Department of Ag. Economics
Michigan State University

APPENDIX 2

March 16, 1981

Related Papers

MICROCOMPUTER SOFTWARE FOR PROFESSIONAL USE

-- NOTES ON PROGRAMS WITH EMPHASIS ON

APPLE, TRS-80, AND CP/M

PART I Word Processors for Microcomputers - Comparisons and References by Robert D. Stevens, Staff Paper #82-16, pp. 160.

PART II Data Base Management and Other Programs for Professionals Using Microcomputers - Comparisons and Reference Materials, Robert D. Stevens, (pp. 80), Staff Paper #82-22.

PART III Statistics Packages for Microcomputer by Robert D. Stevens and Vallerie Kelly, (pp. 70) Staff Paper #82-23.

Separate Summary Comparisons

1. Word Processor Software of the Apple II Microcomputer - Summary of Comparisons by Robert D. Stevens, Staff Paper #82-21, pp. 9.

2. Comparisons of Data Base Management Programs for the Apple, TRS-80, and CP/M Microcomputer Systems by Robert D. Stevens, Staff Paper #82-31, pp. 16.

3. Comparisons of Statistics Program Packages for the Apple and TRS-80 Microcomputers by Robert D. Stevens and Valerie Kelly, Staff Paper #82-32, pp. 10.