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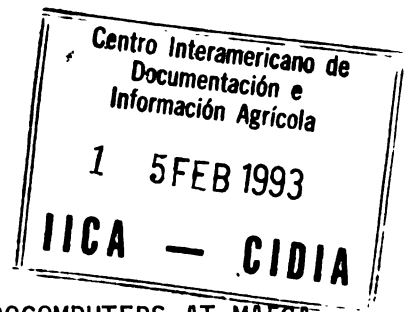
Centro Interamericano de
Desarrollo e Información
1 FEB 1983
IICA - CIDIA

THE INTRODUCTION
OF
MICROCOMPUTERS

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SEMINAR / WORKSHOP ON : THE INTRODUCTION OF MICROCOMPUTERS AT MAFCA

✓
"PROGRAMMES AND PROGRAMMING (LANGUAGES, SPECIFIC AND
GENERIC PROGRAMMES)".

/
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MINISTRY OF AGRICULTURE, FOOD AND CONSUMER AFFAIRS (MAFCA)

GRAEME HALL, CHRIST CHURCH

16th-17th, 1985.

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PROGRAMMES AND PROGRAMMING
(Languages; generic and specific language)

SYSTEM CONFIGURATION

The computer system as used in the context of this seminar is made up of the following components:

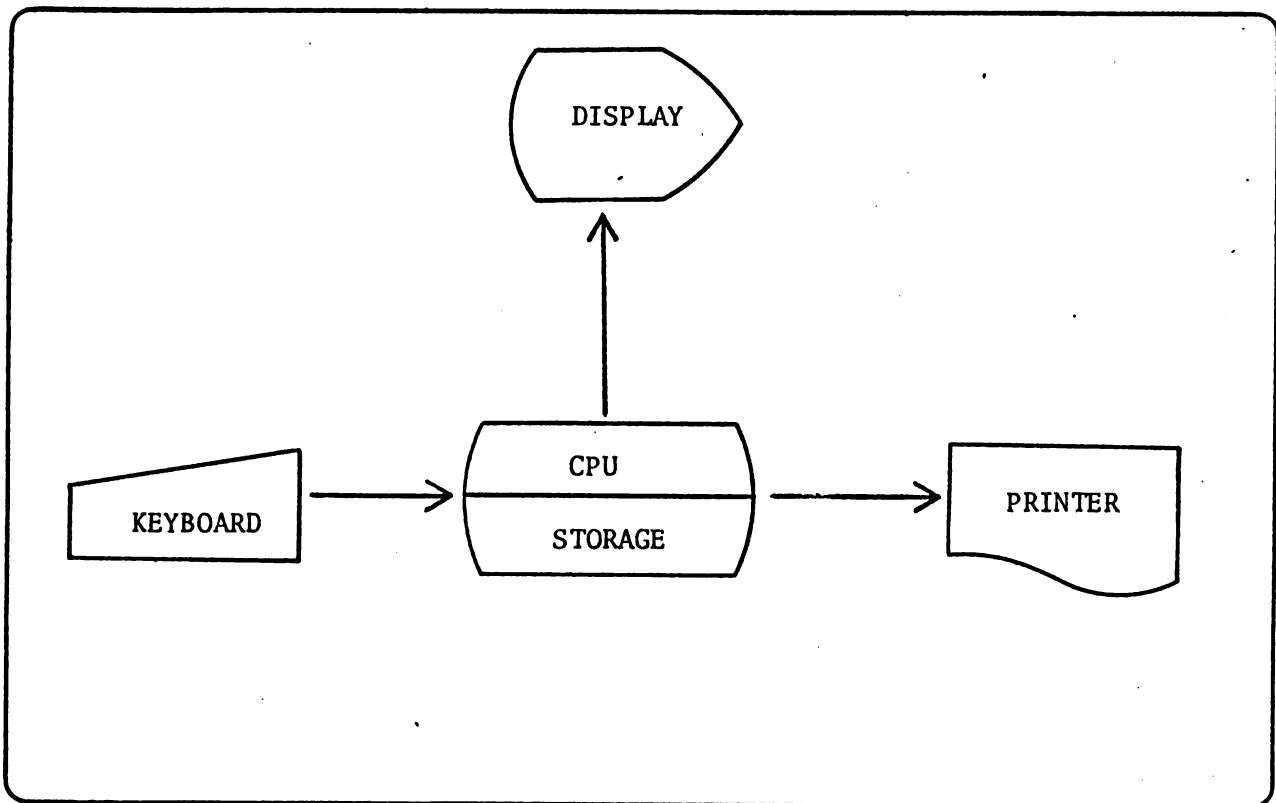


Figure 1: System Configuration of a Microcomputer

1. a.

CHARACTER CODES

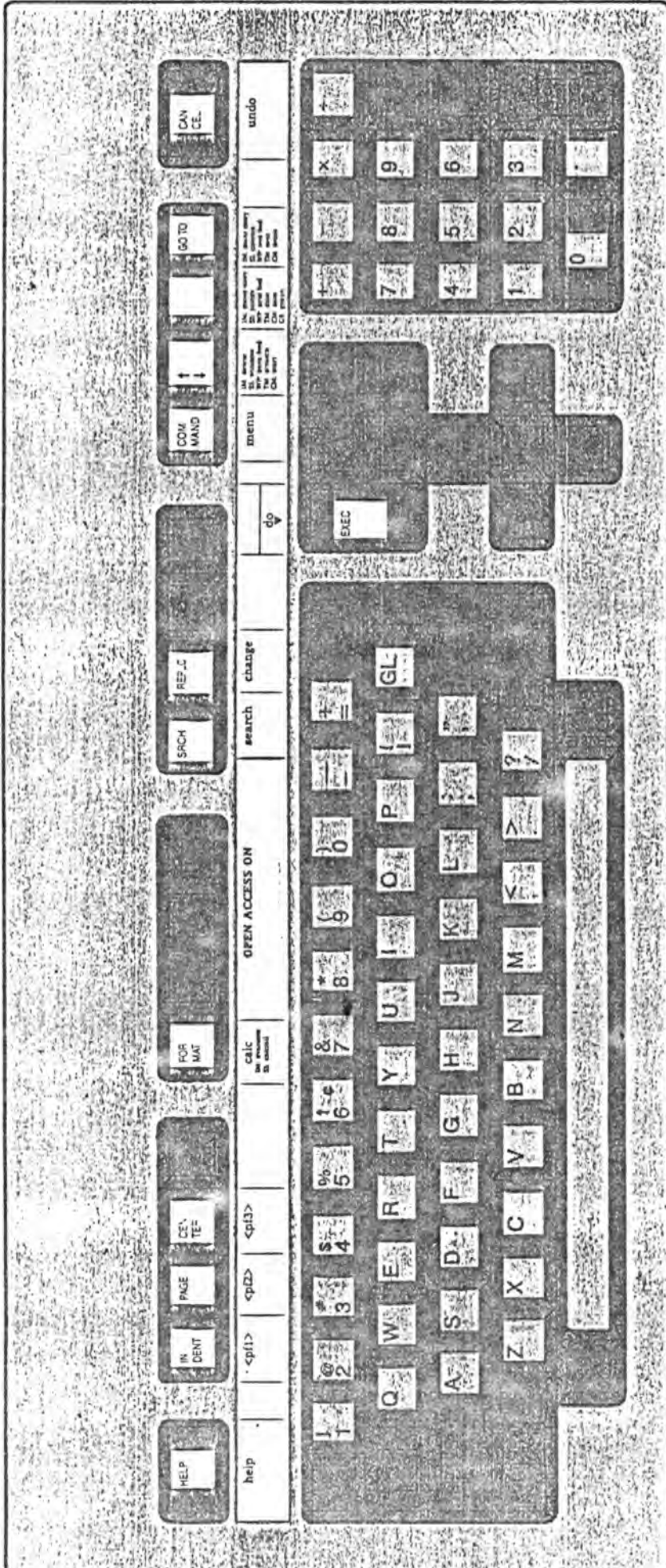
To input, to output or to store data into a computer, a standard character code set is required.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SPACE	0	@	P	.	p	°	À	â	Ĝ	ğ	Ð	þ	£
1			!	1	A	Q	a	q	•	Á	à	U	ŭ	Ð	ð	ƒ
2			"	2	B	R	b	r	▲	Â	á	í	ı	Ý	ý	¥
3			#	3	C	S	c	s	■	Ã	ä	ı	ı	Ş	ş	¼
4			\$	4	D	T	d	t	▬	Ä	å	ı	ı	'	'	½
5			%	5	E	U	e	u	▬	—	—	ı	ı	Ú	ú	¾
6			&	6	F	V	f	v	▬	À	á	ı	ı	Û	û	.
7			'	7	G	W	g	w	▬	ı	†	L·L	ıı	Ü	ü	.
8			(	8	H	X	h	x	▬	Æ	æ	Ñ	ñ	Ü	ü	.
9			)	9	I	Y	i	y	▬	Ç	ç	Ó	ó	é	é	..
A			.	:	J	Z	j	z	▬	‡	□	Ó	ó	◊	◊	.
B			+	:	K	[	k	[	▬	●	REQ. SPACE	Ó	ó	Ŕ	Ŕ	.
C			,	<	L	\	l	|	▬	É	é	Ö	ö	œ	œ	˘
D			-	=	M	]	m	]	▬	È	è	Ö	ö	«	»	.
E			.	>	N	ı	n	ı	▬	É	é	Œ	œ	§	§	5 UNIT SPACE
F			/	?	O	_	o	e	▬	È	ë	Ø	ø	¶	¶	DEAD KEY

Figure 1. a. ASCII Character codes.



1. b.



Keyboard Layout

Machine and high-level languages

Microcomputers are engineered electronically to operate on and execute instruction internally using a language designed into the machine. This language is referred to as the computer's native language. These are not the most effective nor efficient languages in which to write a computer programme.

The most desirable language is one that permits programmes to be written in a language more native to humans than to machines.

Machine-oriented languages

Since machine-oriented languages are closest to the computer's native machine language in form and context, the programmer is permitted to take the full advantage of the capabilities and features of the microcomputer. This language is referred to as Assembler language.

A source program written in Assembler must be translated into a computer's native machine language before the micro can execute a program.

High-level languages

This language is designed to permit the programmer to write his source program in a language more native to humans than to machines. The source program must still be translated into the language native to the computer before the actual program can be executed. This translation is accomplished by a program referred to as a compiler. The translated program is known as the object program.

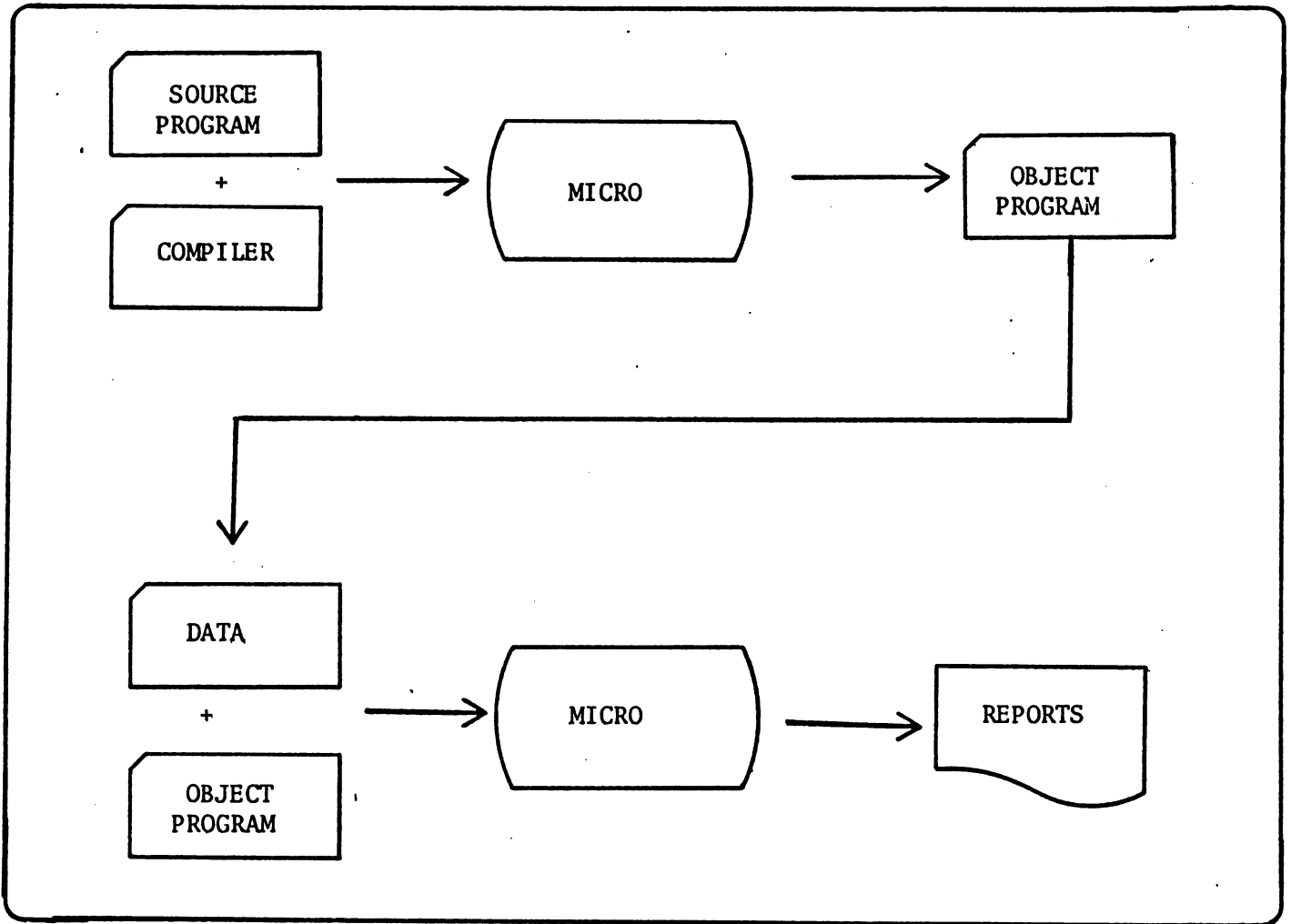


Fig 2. Steps to transform a source program into an executable object Program

Software

Software is a term used to refer to computer programs or languages. Software gives your computer its personality. Without software, your computer would be no more useful than a paperweight.

Software is divided into 3 categories and could be represented just like a cake, each layer supporting the one above it:

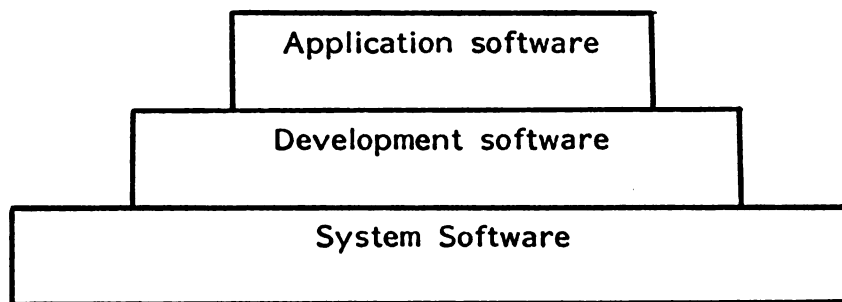


Fig. 3 Degrees of approach to native machine language.

Application software solves a particular business, recreational or educational problem. VISICALC, SPSS, dBASE II, are some examples of application software. These programs were created with programming languages like FORTRAN, BASIC, Pascal. These programming languages are the development software, and to run or execute them we need some operating system like DOS, CP/M, OS, which also are known as system software.

DOS

An operating system is the system software that manages the resources of the computer. DOS handles all low-level functions of the computer like the ability to co-exist with application or development programs while they execute.

These programs then call upon the operating system's resource handling capabilities. You can talk to DOS directly by typing commands on the keyboard.

BASIC

The most widely used programming languages for personal computers is BASIC, which stands for Beginners All-purpose Symbolic Instruction Code.

For your computer to understand BASIC, it must run a machine language program made up of 1's and 0's. The BASIC Interpreter is a program to help you write your object programs.

You can type your BASIC statements in direct or indirect mode. Direct means that you want the statements you enter to be executed immediately. Indirect mode means that you want to execute the statement at a later time.

Programs are created by using the indirect mode. A line number preceding a statement tells BASIC to store the statement in its workspace as part of the program. The stored program statements are executed in order of the line number you gave them:

```
10 PRINT "Good morning"
```

BASIC programs can be very simple or very complex depending on what you want to do:

```
10 INPUT Empno, Salary, Bonus, Deduct
20 IF Empno = 1 THEN STOP
30 LET Gross = Salary + Bonus
40 LET Net pay = Gross - Deduct
50 PRINT Empno, Gross, Net pay
60 GOTO 10
70 END
```

Fig. 4 Listing of BASIC source program

FORTRAN Language

FORTRAN (FORmula TRANslator) is a language that allows the programmer to write source programs in the language of the engineer or the scientist. Program statements can be written in a format close to the mathematical equations normally used. FORTRAN is used to write programs that involve large amounts of mathematical computations.

The source program written in FORTRAN is composed of statements that are analyzed by the FORTRAN compiler and translated into a usable native machine language program referred to as the object program.

```
10 READ (2,40) empno, salary, bonus, deduct
   IF (empno) 30, 30, 20
20 gross=salary+bonus
   netpay=gross-deduct
   WRITE (3,40) empno, gross, netpay
   GOTO 10
30 STOP
40 FORMAT (4 F10.2)
   END
```

Fig. 5 Listing of FORTRAN source program

COBOL Language

COBOL (Common Business Oriented Language) was developed in 1961 to provide business and industry with a programming language that could be used to write computer programs that were independent of the actual make or model of computer used. A COBOL source program is divided into four basic divisions; that is Identification, Environment, Data and Procedure.

The partial instruction to a computer written by the programmer for processing a sales order might look like the following:

1. Sort sales-order reports by parish.
2. Find the first sales order for parish.
3. If no more records for this parish, go to the next parish.
4. Add sale amount to "total sales" data area.
5. Add tax amount to "tax" data area.
6. Return to Step 2.

This procedure accumulates the sales amount and tax amount by sales district. The program as written in Figure 6 is a little too informal than is necessary for a computer.

```

PROCEDURE DIVISION
START
  OPEN INPUT SALES-ORDER FILE
  OUTPUT SALES-SUMMARY-FILE
NEXT RECORD
  READ SALES-ORDER-FILE AT END GO TO FINISH
  IF DISTRICT-RECORD IS EQUAL TO
  DISTRICT GO TO UPDATE OTHERWISE GO
  TO ADVANCE
UPDATE
  ADD SALE-AMOUNT-RECORD TO SALES TOTAL
  ADD TAX-AMOUNT-RECORD TO TAX-TOTAL
  GO TO NEXT RECORD
ADVANCE
  MOVE DISTRICT-RECORD TO DISTRICT
  WRITE SALES-SUMMARY RECORD
  GO TO UPDATE
FINISH
  CLOSE SALES-ORDER-FILE SALES-SUMMARY
  FILE
  STOP RUN

```

Figure 6. Listing of COBOL Source Program.

Spreadsheet

An Electronic spreadsheet helps you solve problems that would normally work out with pencils, a calculator, plenty of paper, a big eraser and lots of time. With the spreadsheet your paper is the computer's display and the computer is your calculator. To erase all you have to do is retype the entry. To file your work you simply save it to a disk.

An electronic spreadsheet is neater and quicker than the pencil and paper version. The computer remembers the steps you took to solve a problem, if you want to change any value used in your problem you just have to change that single value and the computer will quickly recalculate all the results that depend on that value.

Recalculation is the real power of a spreadsheet. It allows you to ask "What if..?" questions and evaluate all possibilities, let's assume we are in charge of finances at a pizza restaurant. The price of cheese is going up 20% next month; should you increase your prices? A spreadsheet program can help with this decision.

The worksheet is organized in columns and rows. Each row has a number at the far left and each column has a number or letter across the top. Each individual row and column intersection is called a cell.



Col>	A	B	C	D	E	F	
Row+							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

pointer: A1 current: A1 memory: 100%

type:
 contents:
 edit:

Command: <arrows> <calc> <where> <search> <change> <command> A)uto C)opy
 D)elète E)dge F)ormat G)oto H)elp I)nsert J)oin L)oad M)ove O)ptions P)rint
 Q)uit R)ecalc S)ave T)ransfer U)disk W)hat X)edit Y)dump =)lock *)screen

COL>|A|B|C|D|E|F|

PRODUCT REPORT BY MONTH WITH FORECAST

ROW		MARCH	APRIL	MAY	OCTOBER
3		3	4	5	10
7	REGION A				
8	PRODUCT1	\$590.00	\$737.50	\$300.00	\$-327.50
9	PRODUCT2	\$85.00	\$280.00	\$238.00	\$660.00

Text across c

Left, right and c justification of t numeric entries

Linear regression projection built

[#5:COVER] pointer: F9 current: F9 memory: 99%

type: numeric:right justified

contents: +PROJ(10)

edit: +PROJ(10)

Command: <arrows><calc><where><search><change><command>A)uto C)opy
 Delete E)dge F)ormat G)oto H)elp I)nsert J)oin L)oad M)ove O)ptions P)rint
 Q)uit R)ecalc S)ave T)ransfer U)disk W)hat X)edit Y)dump =)lock *)screen

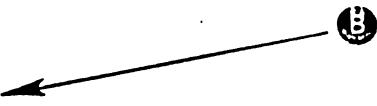


BALANCE SHEET ← **(f)**
5-31-83
INITIAL

ASSETS

CURRENT ASSETS
CASH \$8,000,000.00
ACCOUNTS RECEIVABLE \$100,000.00
INVENTORY \$5,225,000.00

TOTAL CURRENT ASSETS \$13,325,000.00



TOTAL ASSETS \$13,325,000.00



TOTAL ASSETS \$13,325,000.00

LIABILITIES & EQUITY

CURRENT LIABILITIES
ACCOUNTS PAYABLE \$9,000.00
NOTES PAYABLE \$4,810,000.00

TOTAL CURRENT LIABILITIES \$4,819,000.00

TOTAL LIABILITIES \$4,819,000.00



OWNERSHIP & EQUITY
CAPITAL \$8,500,000.00
NET INCOME \$6,000.00

TOTAL WORTH \$8,506,000.00

TOTAL OWNERSHIP & EQUITY \$8,506,000.00

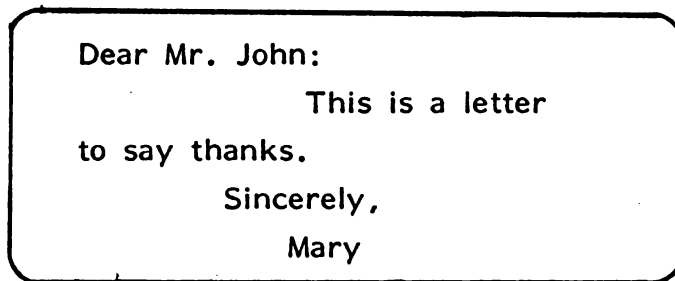
TOTAL LIABILITIES & EQUITY \$13,325,000.00



Word Processing

If you write a lot of letters, manuscripts or reports, a word processing program will increase your productivity and efficiency.

The screen becomes your paper, and you can see how your text, or document, is going to look before it is printed. Anything you don't like can easily be changed:



Dear Mr. John:

This is a letter
to say thanks.

Sincerely,
Mary

Fig. 7 Entering a document onto the screen

The diskette is your file cabinet. On it you can store large or small documents. You can then transfer the document to your printer, or to another computer via phone lines so it can be printed elsewhere.

The lines at the top of the screen show you the current status of your word processing session.

In short, a word processing program is an application software package that allows you to create a file of textual information and then edit and print the contents of the text as necessary. Some common features of word processing application software are:

- Merge
- Page
- Sort
- Copy + delete documents
- Spelling checker (Dictionary)
- Global search + replace
- Mathpak
- Automatic pagination
- Automatic centering
- Automatic underscore
- Search and replace
- Decimal tabulation

Database

A database management system is a software tool that manipulates information stored in databases. The system is used for the interrogation, maintenance, and analysis of data. Database management has several objectives:

- To make an integrated collection of data available to a wide variety of users
- To provide for quality and integrity of data
- To ensure privacy through security measures throughout a system
- To allow centralized control of database, which is necessary for efficient data administration

Data independence is an essential part of the database model which is referred to as "relational". In a relational model, information is represented in only one way to the user: by data values. Because user requests do not depend on internal representation, the system is free to choose any physical structure for data storage. Thus, response time to user requests is optimized.

The advantages of databases is that one particular record field can be quickly found in a file made up of thousands of records. A database program would have the following features:

- Define the organisation and elements of each database
- Design screen for data entry output
- Perform data entry and reporting
- Modify, delete, and manipulate data
- Output data in reports
- Create derived fields for existing data in database
- Sort existing data
- Save defined data report specifications
- Maximum file size limited by hardware constraints

MAFCA PLANNING UNIT

REBATES DATA BASE

Id. No.	_____	Tel.No.	_____
Parish	_____	Farm Name	_____
Age	_____	Address	_____
Activity	_____	Location	_____
Size	_____	Years	_____
Tenure	_____	Irrigation	_____
Type	_____	Enterprise	_____
Approved	_____	Amount	_____
Furrowing	_____	Harrowing	_____
Ploughing	_____	Rotavate	_____
Year	_____	Service	_____

- Add or delete a field to record format without affecting existing data
- Change attributes of fields (eg. change length) without affecting data
- Merge data with word processing documents
- Support menu and screen prompts
- On-line help
- Create report as word processing documents
- Create a file which is spreadsheet compatible

Business Graphics

The purpose of this application software is to produce: plots, bar charts, pie charts and 3 dimensional graphics. A good graphics package would have the following features:

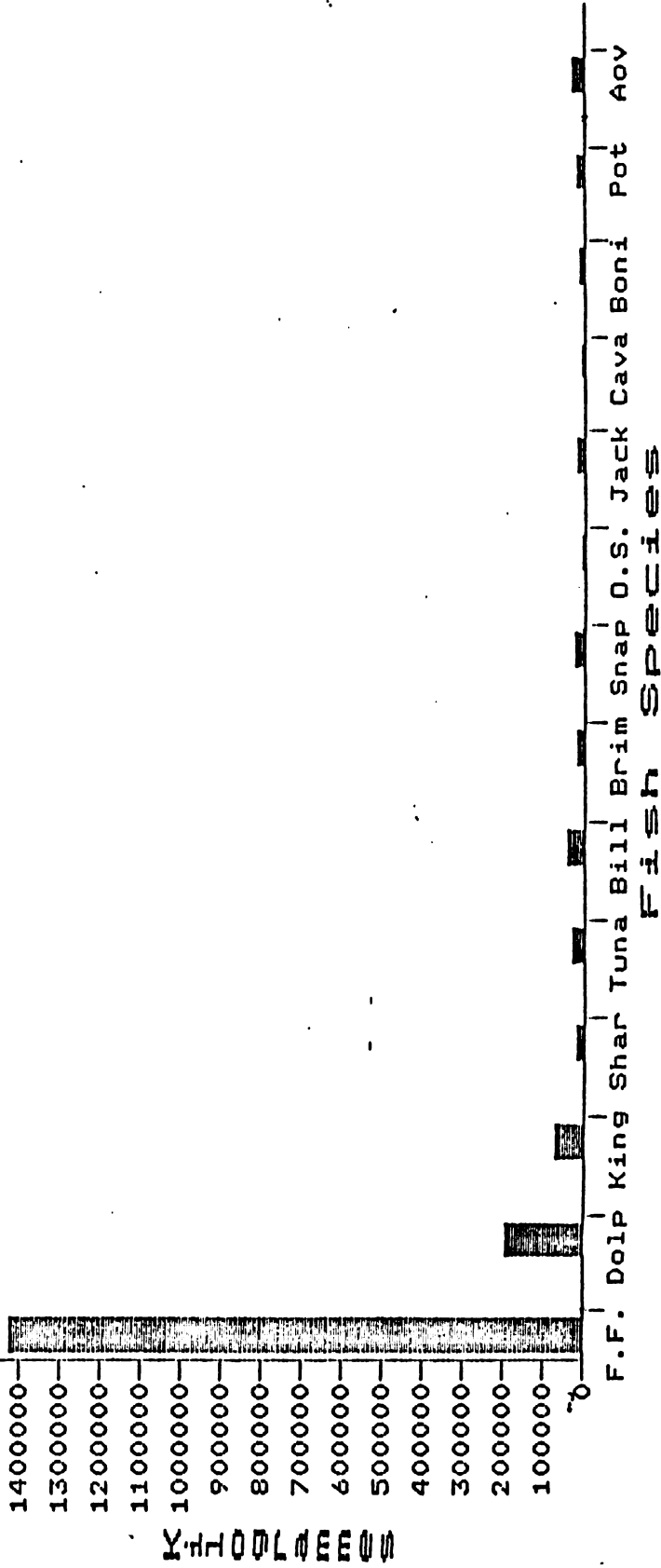
- to provide easy access
- to handle sophisticated business charting needs
- to support a large number of printers and plotters
- to accept data from other applications
- to accept placement of vertical and horizontal titles
- to plot lines and bar charts on the same axis
- to manipulate data in statistically meaningful presentations

Some print-outputs with these capabilities follows:

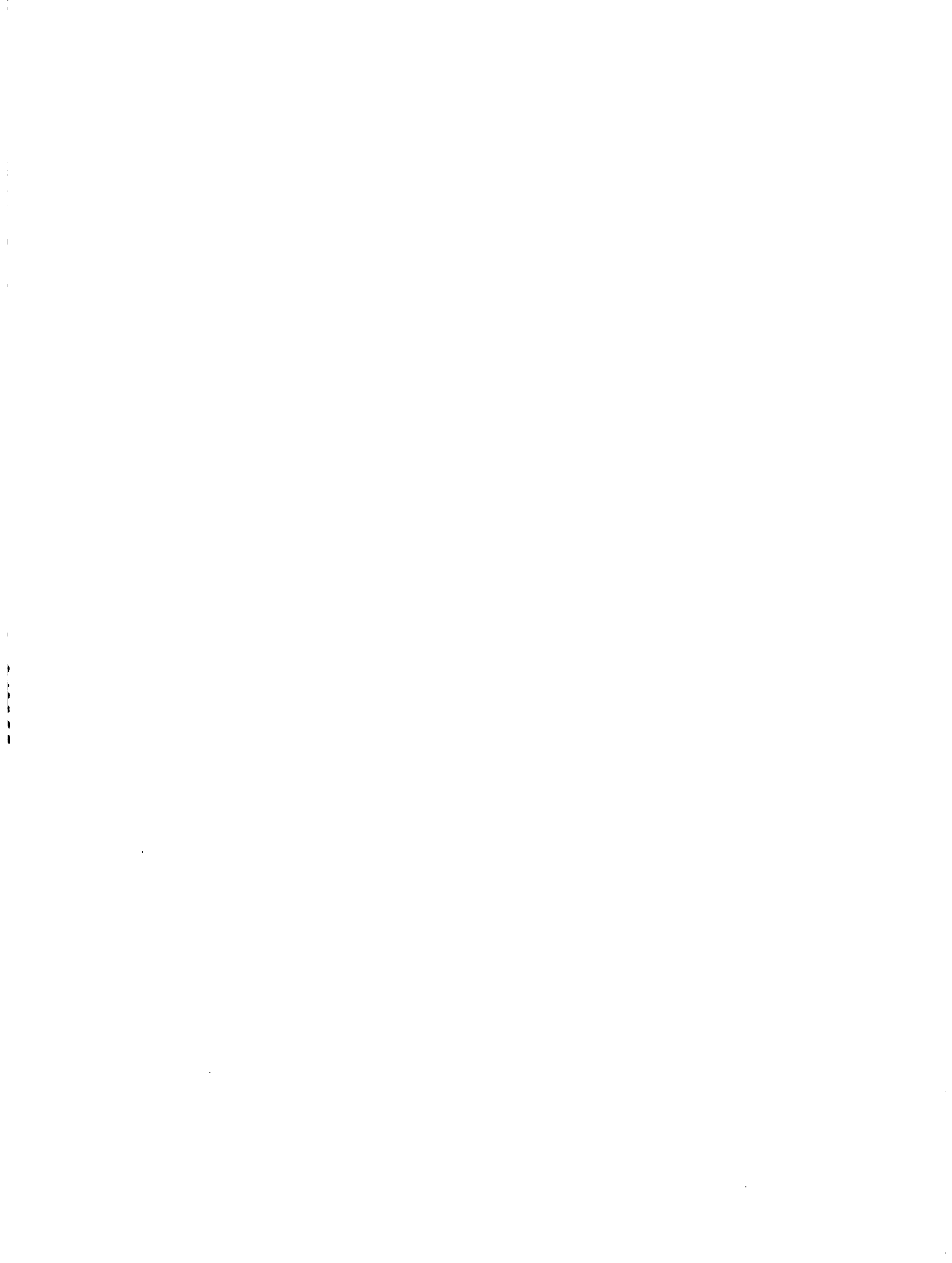
Statistical System

The statistical package provides a bridge for education, science, business, and industry to the area of forecasting and data analysis. It

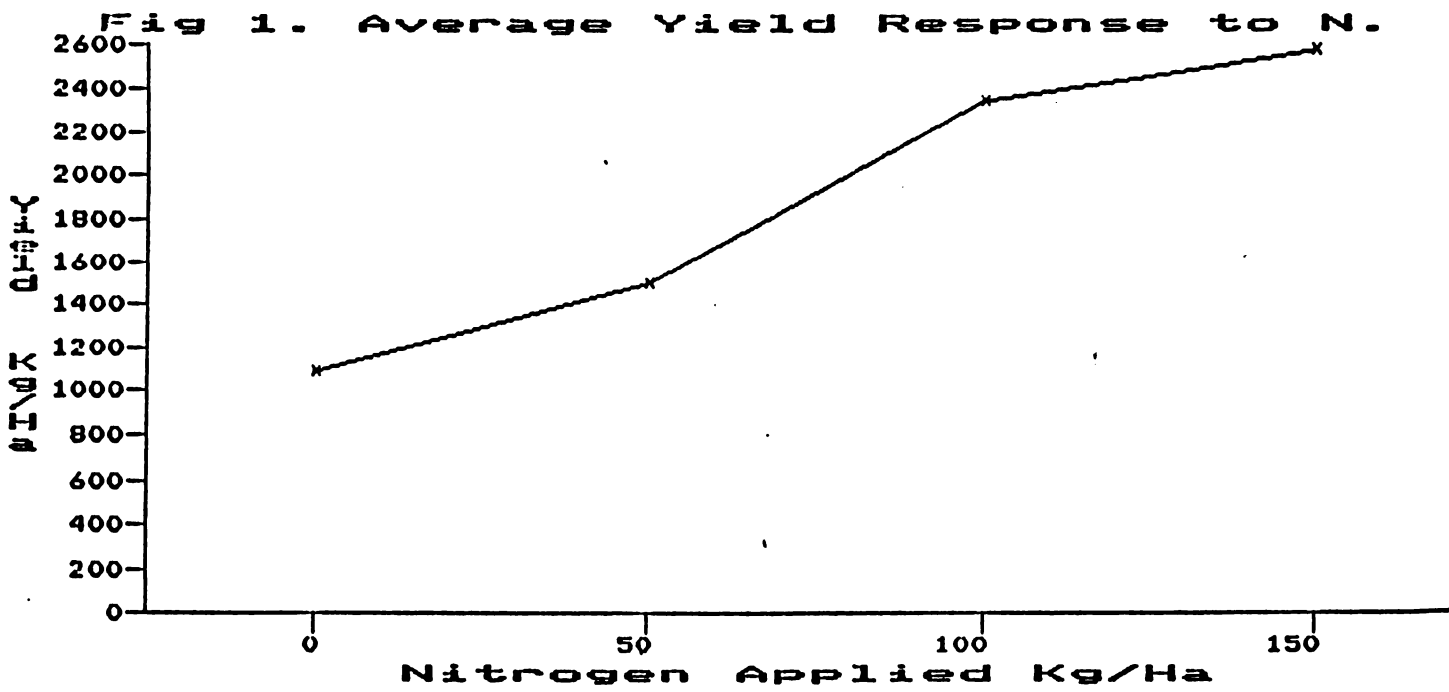
Distribution Of Landings By Species 1984



Business Graphic's print output example



11. b.



Plot feature of Statistical System.

provides a common means for workers in each of these areas to share methods of forecasting and data analysis that have been found useful to many areas of such endeavour. Specifically, it is designed for use by three different types of users: the businessman, technologist, and professional analyst.

Some features of this system follows:

- Breakdown, to calculate summary statistics according to a grouping or classification.
- Chart, to calculate statistics useful to construction control charts in quality control.
- Compute, to compute forecasts, fits and residual.
- Correlate, to compute the correlation between pairs of variables
- Curve, to fit several common curve types to data.
- Kolmogorov, to perform non-parametric tests.
- Plot, to produce a plot.
- Polynomial, to fit data to a polynomial of a specific degree.
- Statistics, to produce descriptive statistics.
- T Test, to perform a comparison of two data sets.

The Economic Analysis Package

This specific program is designed for experiments which examine factors affecting crop yield, such as the use of fertilizer, herbicide, or insecticide, or method of tillage or planting. The program calculates the economic net benefit (net return) of each treatment,

based upon information supplied by the research on the value (price) of the crop output and the cash, in kind and family labor costs associated with each treatment. If data are available from several experiments incorporating the same treatments, the program will also calculate minimum yield and yield variance for each treatment. The marginal rate of return associated with increasing input levels is also calculated.

Usually the economic analysis will reinforce the results of the agronomic analysis. High economic returns will generally be associated with a statistically significant treatment response. However, there may be instances when a recommendation is justified on the basis of expected economic returns even though a treatment effect is not statistically significant. For instance, a new input or practice may lower the costs of achieving a given level of output.

When evaluating a technology, over-reliance on statistical significant levels is a mistake. Significant levels should be used as initial indicators of the influence of various sources of variance, but should not be treated as answers in themselves.

The economic operation menu displayed onto the screen looks like:

```
ECON: ANALYSIS MENU

YOU MAY:

1. Return to main menu
2. Net benefit analysis
3. Risk analysis
4. Marginal return analysis

OPTION NUMBER?
```

Examples of print output with economic analysis follows:

NET BENEFIT TABLE FOR: B:MAIZE

Treatment	Value of Output	Cash Costs	In-kind Costs	Family Labor Costs	Total Costs	Net Benefit
N - 0	2640.00	0.00	0.00	0.00	0.00	2640.00
N - 50	3600.00	500.00	0.00	200.00	700.00	2900.00
N - 100	5640.00	1000.00	0.00	200.00	1200.00	4440.00
N - 150	6204.00	1500.00	0.00	200.00	1700.00	4504.00

VARIABILITY TABLE FOR: B:MAIZE

Treatment	N of Observations	Mean NB	Standard Deviation	Index of Var*	Minimum NB	Average Lowest 2
N - 0	5	2640.00	105.98	4.01	2520.00	2556.00
N - 50	5	2900.00	224.50	7.74	2660.00	2720.00
N - 100	5	4440.00	254.56	5.73	4080.00	4200.00
N - 150	5	4504.00	678.50	15.06	3820.00	3880.00

Index of variability = Std. Dev./Mean X 100

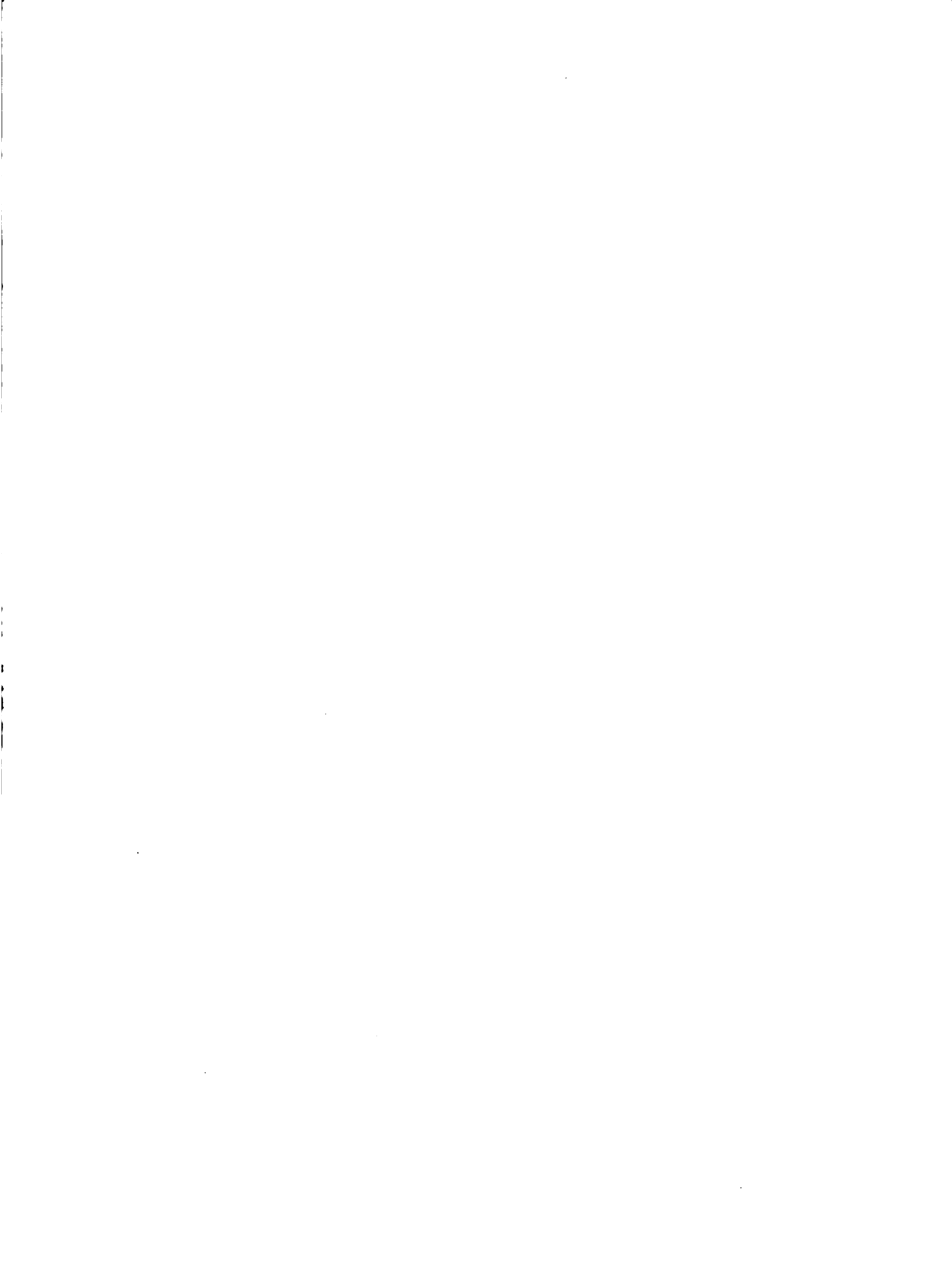
MARGINAL RETURN TABLE FOR: B:MAIZE (Non-dominated treatments only)

Target rate of return: 50

Treatment	Net Benefit	Total Variable Costs	Marginal Net Benefit	Marginal Variable Costs	Marginal Rate of Return %
4 N - 150	4504.00	1700.00	64.00	500.00	12.8
3 N - 100	4440.00	1200.00	1540.00	500.00	308.0*
2 N - 50	2900.00	700.00	260.00	700.00	37.1
1 N - 0	2640.00	0.00	0.00	0.00	0.0

These treatments meet or exceed target rate of return

PRINT OUTPUTS FROM THE ECONOMIC ANALYSIS PACKAGE



THE SURVEY SYSTEM

OVERVIEW.-

The Survey System is an integrated system of programmes for the entry, editing, processing and presentation of survey research results.

TABLES PRODUCED.-

The Survey System can produce two basic kinds of tables:

- Crosstabulations
- Scores

For crosstabulations you can have frequencies, column percentages and row percentages. You can also have column means and standard deviations and/or chi squares with probability notations.

DATA ENTRY AND EDITING.-

Data is easily entered at the keyboard. The system has full data editing capabilities. Questionnaires can be added to or deleted from an existing data file. Data files can be combined. Files can be checked for values that are out of range.

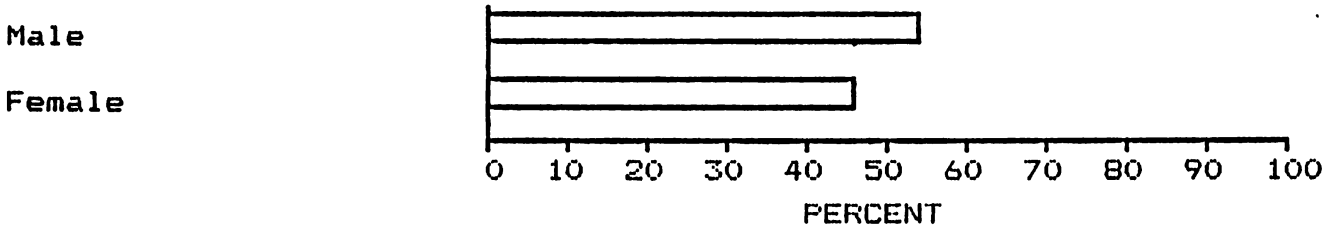
ORGANIZATION OF THE SURVEY SYSTEM

The System is an integrated package of programs. Each program handles a related group of tasks, these are:

- The main menu
- The data entry
- Instruction programmes
- Processing programmes

TABLE I

Percentage of Boatowners by Sex.



PRINT OUTPUT FROM THE SURVES SYSTEM

AN EXAMPLE OF A CROSSTAB OF A QUESTION ALLOWING MULTIPLE RESPONSES

BRAND X HOUSEHOLD PRODUCT STUDY

TABLE 7: WEEKLY USAGE OF CLEANING AIDS

	S E X		A G E				F A M I L Y I N C O M E			
	TOTAL	FEMALE	MALE	18-34	35-49	50-64	UNDER 15000	15000-25000	25000-35000	& UP
TOTAL RESPONSES	144	60	84	46	50	48	52	44	42	6
BATH SOAP	35.2	62.1	16.7	52.2	29.2	25.0	88.0	9.1	4.8	0.0
LAUNDRY SOAP	31.9	43.3	23.8	100.0	0.0	0.0	53.8	27.3	14.3	0.0
DISH SOAP	27.8	36.7	21.4	73.9	4.0	8.3	46.2	27.3	4.8	33.3
ALL-PURPOSE CLEANER	26.5	29.6	24.4	63.6	4.2	13.6	43.5	27.3	5.0	33.3
GLASS CLEANER	22.1	33.3	14.6	50.0	8.3	9.1	39.1	18.2	5.0	33.3
BLEACH	19.7	21.7	18.4	50.0	5.0	4.8	31.6	15.0	10.5	33.3
Mean	27.2	37.8	19.9	65.0	8.4	10.1	50.4	20.7	7.4	22.2
S.D.	5.8	13.9	4.0	19.6	10.5	8.6	19.9	7.8	4.1	17.2

THE INTRODUCTION
OF
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