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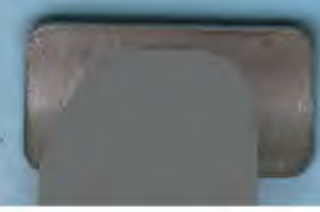
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IICA - CIDIA

COMPUTER APPLICATION
FOR
NUMERICAL DATA ANALYSIS

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Ministry of Agriculture and Natural Resources
Planning Unit
Graeme Hall, Christ Church
February, 1986





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COMPUTER APPLICATION

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INTRODUCTION

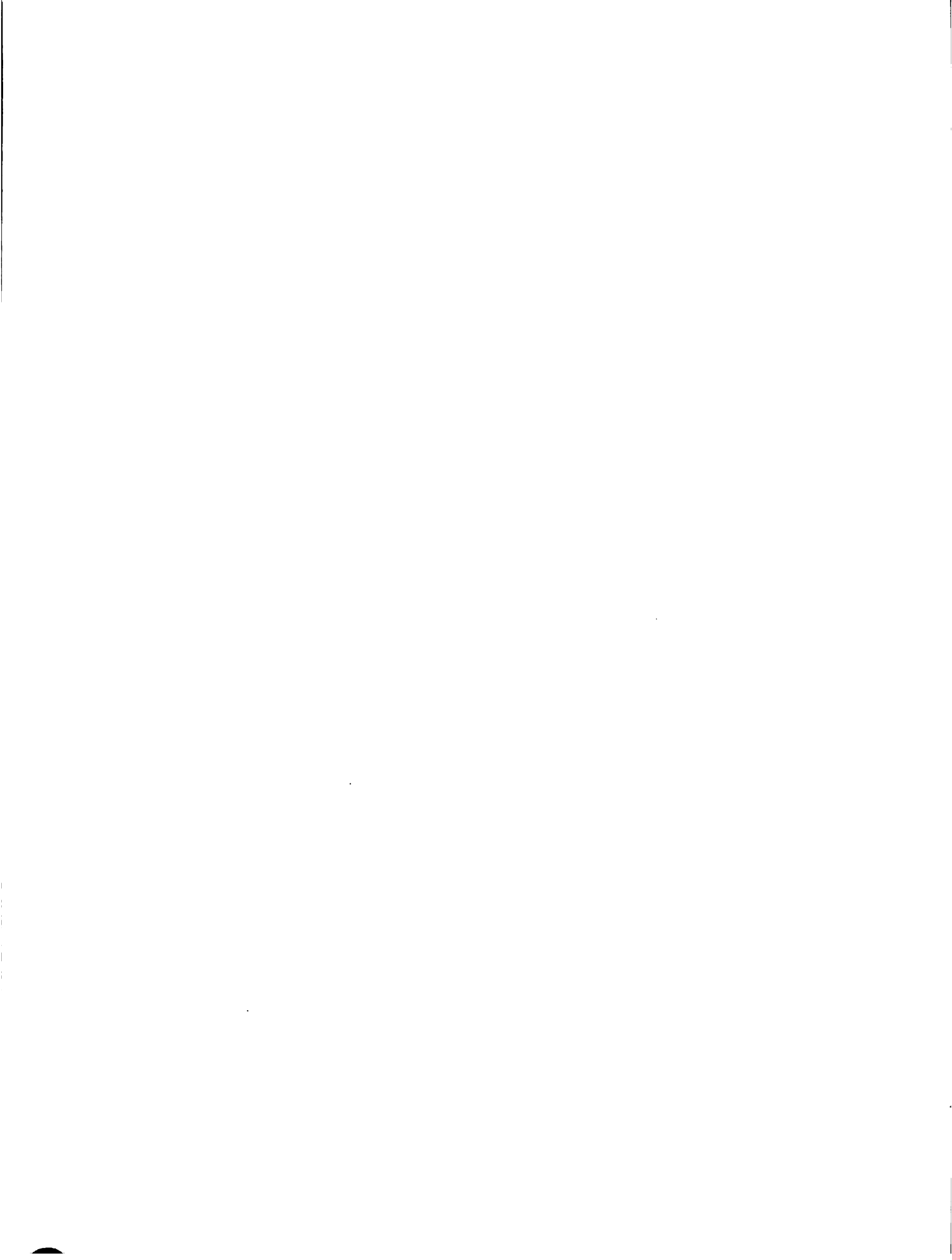
There is worldwide revolution in microcomputer technology underway and scientists are struggling to find ways to utilize this new technology to help solve developing problems.

The Ministry of Agriculture and Natural Resources(MANR) Planning Unit has developed considerable experience in using microcomputers in agronomic research and numerical data bases through its work with the Inter-American Institute for Cooperation on Agriculture(IICA). A Wang P.C. is in operation since November 1984 and methodologies and application software has been developed accordingly.

HARDWARE:

Planning Unit's microcomputer is running on a lease with purchase option basis from November 1984 to March 1986. The configuration is as follows:

- WANG P.C. 256 Kbytes, Dual Disk Drive, Graphics Card, Intel 8086 Microprocessor, 8 MHZ Clock Speed and 5 $\frac{1}{4}$ " DSDD.
- Matrix parallel Printer
- Letter Quality Printer
- Keyboard
- Monochrome Monitor



SOFTWARE

At Planning Unit the following interactive software packages are in operation.

1. System Software, Industry Standard

- MS-DOS Operating System
- Microsoft Basis-86 interpreter
- Library of Utilities

2. Application Software. Complete document compatibility with other WANG System also communications option.

- Multiplan Electronic Spreadsheet: Ready to use with financial planning and modeling, budgeting and forecasting, payroll and benefit cost analysis.
- Data Base: To define the organization and elements of each Data Base, design screen for data entry, Perform data entry and reporting, modify, delete and manipulate data, create reports as a Wang Word Processing Document and creates a file which is Multiplan compatible.
- Business Graphics: Handles sophisticated business charting needs, plots lines, draws bar charts and manipulates data in statistical meaningful presentations.
- Word Processing: Plenty of facilities to merge, page, sort, copy, delete documents, automatic centering, pagination and underscore, finally decimal tabulation.

3. Statistical programs. Developed at Planning Unit to support research and extension of MANR's Units.

- ONE WAY. Performs a one-way analysis of variance (ANOVA) to compare the means of data divided into several classes.
- TWO WAY. Perform a two-way analysis of variance (ANOVA) to compare the means of a variable dependent upon two factors or classes.
- THREE WAY. Perform a two factor analysis of variance (FACTORIAL AXB) to compare main effects and interactions.
- FOUR WAY. Perform a three factor analysis of variance (FACTORIAL AXBXC) to compare main effects first order interactions and second order interactions.
- SPLIT PLOT. To be used when an additional factor is to be incorporated in an experiment to increase its scope. Perform a whole plot and subplot analysis of variance.
- SPLIT-SPLIT PLOT. Performs a whole plot, subplot and sub-sub plot analysis of variance (with different precision).
- DUNCAN. Performs comparisons among treatment means. Compares each treatment mean with every other treatment mean.
- CORRELATION. Computes the pair-wise correlation coefficients between variables.



- LINEAR MODELS. Computes the linear regression equation relating the dependent variable to one independent variable according to the menu of options:

1. Linear regression
2. Semilogarithm regression
3. Logarithm regression
4. Geometric regression
5. Exponential regression
6. inverse regression

- MULTIPLE REGRESSION. Computes the linear multiple regression equation relating the dependent variable to one or more independent variables. Performs analysis of variance and standard error of parameter.

- STEPWISE. A technique to find which variables of a collection of independent variables should most likely be included in a regression model.

- DISTRIBUTION. To evaluate exact probabilities for the following distribution functions. .

1. CHI-SQUARE
2. FISHER'S F
3. NORMAL Z
4. STUDENT'S T

4. **Statistical Packages.** A statistical package is defined as a software package which computes any of the commonly accepted statistical tests over and above descriptive statistics.

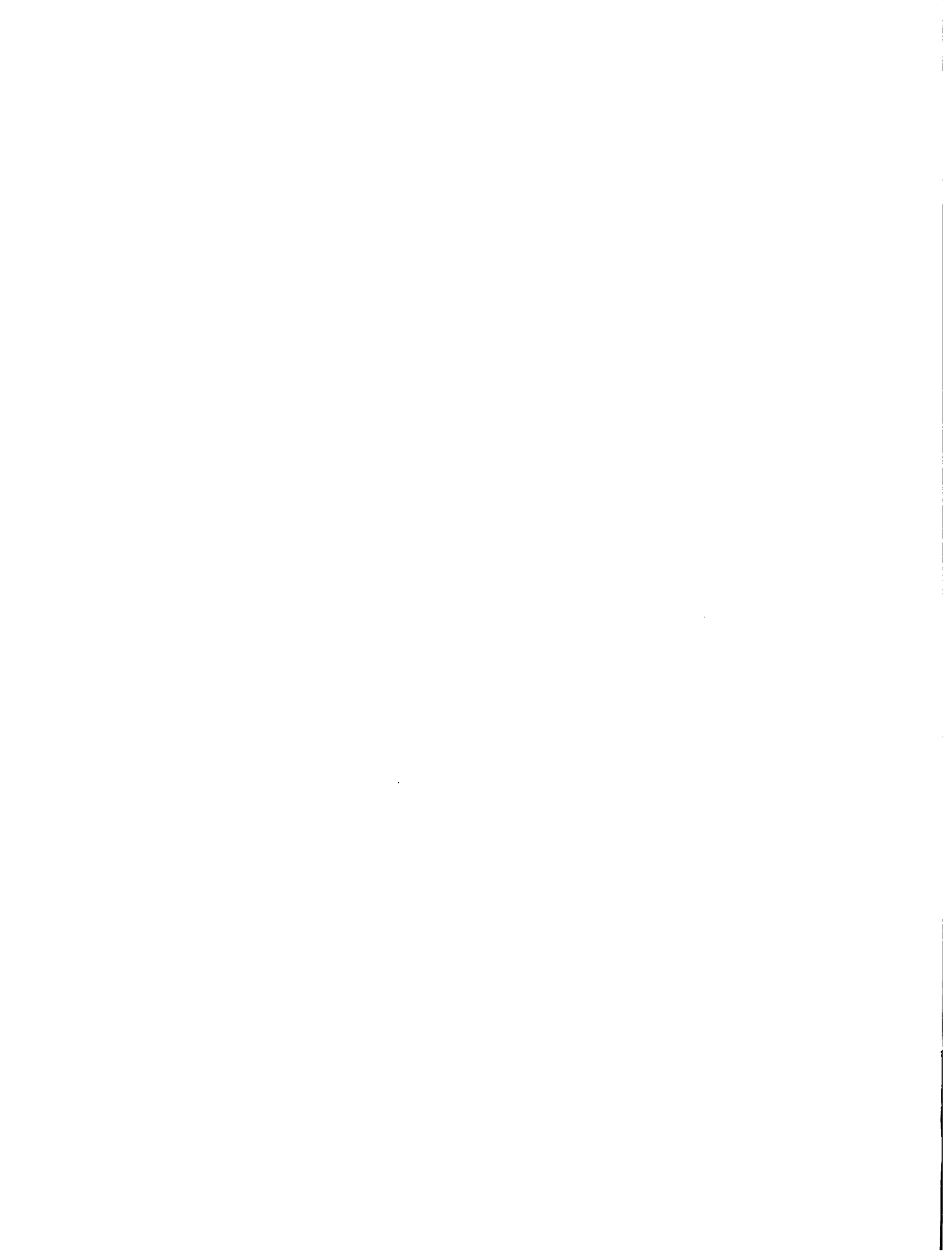
- **MSTAT.** A microcomputer program developed at Michigan State University for the design, management, and analysis of agronomic research experiments. We use it at Planning Unit because its easy access, low cost, user friendly, data security and product support. Some functions of the package are:

- Merges two MSTAT files end-on-end
- Computes a one-way analysis of variance
- Computes a two-way analysis of variance
- Computes a lattice analysis of variance
- Creates blank data cases
- Prints books for breeding material
- Prints labels for breeding material
- Updates generation and prints pedigree
- Computes conversion of data using BASIC equations
- Computes simple correlations and regression
- Data entry procedures

- **Creating new variables**
- **Marginal returns analysis**
- **Prints field books based on EXPPLAN**
- **Print labels based on EXPPLAN**
- **Prints field maps of EXPPLAN**
- **Generates CRD and RCB designs**
- **Computes freq & histograms of data variables**
- **Creates MSTAT files from ASCII files**
- **Reformation of MSTAT files from TOTEMP files**
- **Groups data values into specific group categories**
- **Heirarchical analysis of variance**
- **Screen listing and editing of data**
- **Computes and stores means in an ASCII file**
- **Computes multiple regression for ind/dep variables**
- **Renaming variables**
- **Renaming file title**
- **Computes a nonorthogonal analysis of variance**



- Creates an X-Y scatter plot of any two variables
 - Listing of data files on a printer
 - Computes within & between group regr anal & ANOVA
 - Explanation of selection setup
 - Creates new files using selection data
 - Sorts data with 4 levels of keys
 - Computes summary statistics of variables
 - Tabular transformation of data
 - Creation of ASCII files
 - Prints field books of VARPLAN
 - Creates and prints field maps of VARPLANS
 - Creates varietal name and accession number files
 - Creates yield trial designs based on VARNAME data
- S.S. Is a system survey package to evaluate data collected through sampling survey and census. At Planning Unit two (2) surveys have so far been evaluated: Fisheries and Integrated Livestock Survey. Performs: descriptive statistics, cross tabulations, relation analysis and data base functions.



ANNEX A

EXAMPLES OF MICROCOMPUTERS APPLI CATI ONS



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PLANNING UNIT — MAFCA

Nitrogen Content of Red Clover Plants

Table 1. Experimental Data (Original Values).

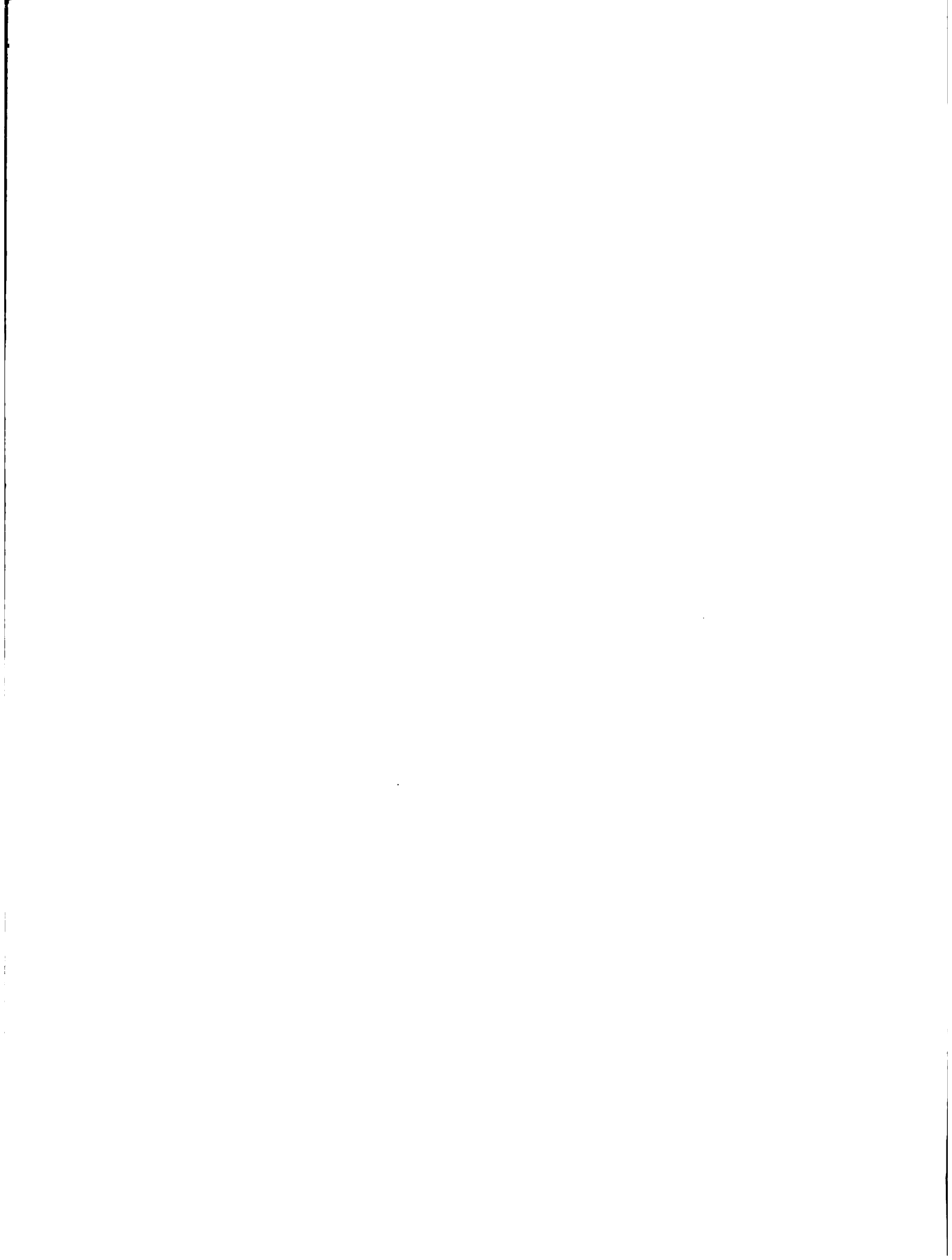
=====

Treatments	Repli 1	Repli 2	Repli 3	Repli 4	Repli 5	Means
3dok1 Lb	42.680	71.720	59.400	70.620	72.600	63.404
3dok5 Lb	38.940	54.560	61.380	55.440	53.460	52.756
3dok4 Lb	37.400	42.680	20.020	26.180	34.760	32.208
3dok7 Lb	45.540	46.200	45.100	41.360	40.920	43.824
3dok13 Lb	31.460	31.680	25.960	25.520	31.240	29.172
Composite Lb	38.060	42.680	42.020	37.180	45.760	41.140

Table 2. One Way Analysis of Variance.

=====

SOURCE	S.S.	D.F.	M.S.	F.	Prob.
Treatments....	4099.711	5.000	819.942	14.371	0.000
Exp. Error....	1369.359	24.000	57.057		
Total.....	5469.071	29.000			



PLANNING UNIT — MAFCA

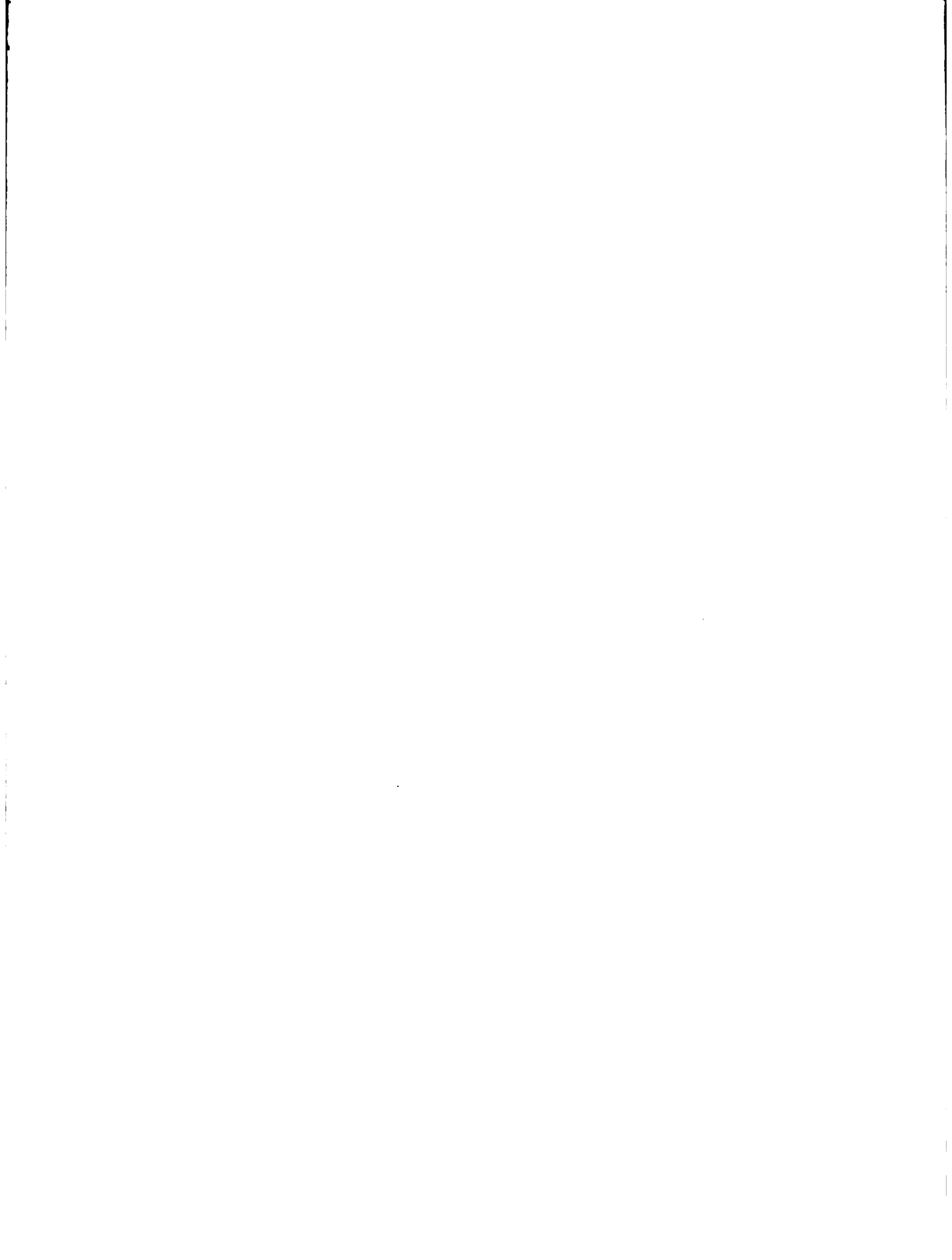
Oil Content of Redwing Flaxed Inoculated

Table 1. Experimental Data (Original Values).

Treatments	Block 1	Block 2	Block 3	Block 4	Block 5	Means
Seedling Kg	21.296	28.556	29.040	19.844	0.000	24.684
EarlyBird Kg	15.972	9.196	23.716	34.364	0.000	20.812
Full Moon Kg	21.296	19.360	21.780	15.004	0.000	19.360
FullBloom Kg	32.912	31.944	33.880	30.976	0.000	32.428
Ripening Kg	30.492	23.716	28.556	34.364	0.000	29.282
Uninocul Kg	30.976	35.332	37.268	32.428	0.000	34.001

Table 2. Two Way Analysis of Variance.

SOURCE	S.S.	D.F.	M.S.	F.	Prob.
Blocks.....	73.586	3.000	24.529	0.797	0.517
Treatments....	741.467	5.000	148.293	4.816	0.008
Exp. Error....	461.867	15.000	30.791		
Total.....	1276.920	23.000			



PLANNING UNIT — MAFCA

Square root of the number of quack-grass shoots per sq inch

Table 1. Experimental Data (Original Values).

=====

Fac.A	Fac.B	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Means
1.	1.	15.700	14.600	16.500	14.700	0.000	0.000	15.375
1.	2.	9.800	14.600	11.900	12.400	0.000	0.000	12.175
1.	3.	7.900	10.300	9.700	9.600	0.000	0.000	9.375
2.	1.	18.000	17.400	15.100	14.400	0.000	0.000	16.225
2.	2.	13.600	10.600	11.800	13.300	0.000	0.000	12.325
2.	3.	8.800	8.200	11.300	11.200	0.000	0.000	9.875

Table 2. Three Way Analysis of Variance.

=====

SOURCE	S.S.	D.F.	M.S.	F.	Prob.
Blocks.....	0.582	3.000	0.194	0.074	0.972
Factor A.....	1.500	1.000	1.500	0.571	0.533
Factor B.....	153.664	2.000	76.832	29.264	0.000
Interaction AB	0.490	2.000	0.245	0.093	0.911
Exp. Error....	39.382	15.000	2.625		
Total.....	195.618	23.000			

General Mean.....	12.558		
Factor A Means...	12.308	12.808	
Factor B Means...	15.800	12.250	9.625



PLANNING UNIT — MAFCA

Weights of denervated muscle under electrical stimulation mg.

Table 1. Experimental Data (Original Values).

A	B	C	Block 1	Block 2	Block 3	Block 4	Block 5	Means
1.	1.	1.	72.000	46.000	0.000	0.000	0.000	59.000
1.	1.	2.	61.000	60.000	0.000	0.000	0.000	60.500
1.	1.	3.	62.000	71.000	0.000	0.000	0.000	66.500
1.	1.	4.	85.000	53.000	0.000	0.000	0.000	69.000
1.	2.	1.	67.000	44.000	0.000	0.000	0.000	55.500
1.	2.	2.	60.000	57.000	0.000	0.000	0.000	58.500
1.	2.	3.	64.000	62.000	0.000	0.000	0.000	63.000
1.	2.	4.	67.000	60.000	0.000	0.000	0.000	63.500
1.	3.	1.	57.000	53.000	0.000	0.000	0.000	55.000
1.	3.	2.	72.000	56.000	0.000	0.000	0.000	64.000
1.	3.	3.	63.000	56.000	0.000	0.000	0.000	59.500
1.	3.	4.	56.000	56.000	0.000	0.000	0.000	56.000
1.	4.	1.	57.000	46.000	0.000	0.000	0.000	51.500
1.	4.	2.	60.000	56.000	0.000	0.000	0.000	58.000
1.	4.	3.	61.000	64.000	0.000	0.000	0.000	62.500
1.	4.	4.	73.000	59.000	0.000	0.000	0.000	66.000
2.	1.	1.	74.000	74.000	0.000	0.000	0.000	74.000
2.	1.	2.	61.000	64.000	0.000	0.000	0.000	62.500
2.	1.	3.	65.000	64.000	0.000	0.000	0.000	64.500
2.	1.	4.	76.000	65.000	0.000	0.000	0.000	70.500
2.	2.	1.	52.000	58.000	0.000	0.000	0.000	55.000
2.	2.	2.	55.000	55.000	0.000	0.000	0.000	55.000
2.	2.	3.	65.000	61.000	0.000	0.000	0.000	63.000
2.	2.	4.	72.000	78.000	0.000	0.000	0.000	75.000
2.	3.	1.	66.000	50.000	0.000	0.000	0.000	58.000
2.	3.	2.	43.000	57.000	0.000	0.000	0.000	50.000
2.	3.	3.	66.000	56.000	0.000	0.000	0.000	61.000
2.	3.	4.	75.000	58.000	0.000	0.000	0.000	66.500
2.	4.	1.	56.000	55.000	0.000	0.000	0.000	55.500
2.	4.	2.	63.000	55.000	0.000	0.000	0.000	59.000
2.	4.	3.	79.000	66.000	0.000	0.000	0.000	72.500
2.	4.	4.	86.000	58.000	0.000	0.000	0.000	72.000
3.	1.	1.	69.000	58.000	0.000	0.000	0.000	63.500
3.	1.	2.	65.000	52.000	0.000	0.000	0.000	58.500
3.	1.	3.	70.000	71.000	0.000	0.000	0.000	70.500
3.	1.	4.	61.000	66.000	0.000	0.000	0.000	63.500
3.	2.	1.	62.000	54.000	0.000	0.000	0.000	58.000
3.	2.	2.	59.000	51.000	0.000	0.000	0.000	55.000
3.	2.	3.	64.000	79.000	0.000	0.000	0.000	71.500
3.	2.	4.	60.000	82.000	0.000	0.000	0.000	71.000
3.	3.	1.	72.000	61.000	0.000	0.000	0.000	66.500
3.	3.	2.	43.000	56.000	0.000	0.000	0.000	49.500
3.	3.	3.	72.000	71.000	0.000	0.000	0.000	71.500
3.	3.	4.	92.000	69.000	0.000	0.000	0.000	80.500
3.	4.	1.	78.000	64.000	0.000	0.000	0.000	71.000
3.	4.	2.	58.000	57.000	0.000	0.000	0.000	57.500
3.	4.	3.	68.000	62.000	0.000	0.000	0.000	65.000
3.	4.	4.	71.000	88.000	0.000	0.000	0.000	79.500



Table 2. Four Way Analysis of Variance.

SOURCE	S.S.	D.F.	M.S.	F.	Prob.
Blocks.....	605.00	1.00	605.00	8.89	0.00
Factor A.....	447.44	2.00	223.72	3.29	0.04
Factor B.....	223.13	3.00	74.38	1.09	0.36
Factor C.....	2145.44	3.00	715.15	10.51	0.00
Interac AxB...	367.97	6.00	61.33	0.90	0.50
Interac AxC...	644.41	6.00	107.40	1.58	0.17
Interac BxC...	298.69	9.00	33.19	0.49	0.88
Interac AxBxC.	1050.81	18.00	58.38	0.86	0.63
Exp. Error....	3199.53	47.00	68.08		
Total.....	8982.41	95.00			

Table 3. Main and Interaction Means.

General Mean.....	63.22			
Factor A Means...	60.50	63.38	65.78	
Factor B Means...	65.21	62.00	61.50	64.17
Factor C Means...	60.21	57.33	65.92	69.42
Inter AxB Means.....				
63.75	60.13	58.63	59.50	
67.88	62.00	58.88	64.75	
64.00	63.88	67.00	68.25	
Inter AxC Means.....				
55.25	60.25	62.88	63.63	
60.63	56.63	65.25	71.00	
64.75	55.13	69.63	73.63	
Inter BxC Means.....				
65.50	60.50	67.17	67.67	
56.17	56.17	65.83	69.83	
59.83	54.50	64.00	67.67	
59.33	58.17	66.67	72.50	



PLANNING UNIT - MAFCA

Yield of Oats in Bushels per acre.

Table 1. Experimental Data (Original Values).

=====

Plot	SubPl	Block 1	Block 2	Block 3	Block 4	Block 5	Means
1.	1.	85.800	83.200	57.800	61.600	0.000	72.100
1.	2.	107.600	117.000	87.800	92.600	0.000	101.250
1.	3.	99.000	107.600	81.400	78.800	0.000	91.700
1.	4.	88.800	83.600	56.600	69.400	0.000	74.600
2.	1.	106.600	139.200	90.800	70.200	0.000	101.700
2.	2.	115.200	139.200	84.800	103.800	0.000	110.750
2.	3.	119.600	131.600	82.800	90.800	0.000	106.200
2.	4.	128.200	114.800	88.200	103.200	0.000	108.600
3.	1.	124.600	117.000	89.200	100.600	0.000	107.850
3.	2.	126.800	100.800	90.000	93.400	0.000	102.750
3.	3.	129.000	92.200	125.200	100.600	0.000	111.750
3.	4.	127.200	112.200	105.400	103.600	0.000	112.100
4.	1.	150.800	131.200	108.000	105.400	0.000	123.850
4.	2.	140.600	134.600	115.200	117.000	0.000	126.850
4.	3.	137.600	130.600	91.200	102.000	0.000	115.350
4.	4.	143.200	138.800	113.200	94.800	0.000	122.500

Table 2. Split Plot Analysis of Variance.

=====

SOURCE	S.S.	D.F.	M.S.	F.	Prob.
Blocks.....	11371.250	3.000	3790.417	13.792	0.000
Plots.....	11391.940	3.000	3797.313	13.817	0.000
Error Plot....	2473.500	9.000	274.833		
Sub Plots.....	682.000	3.000	227.333	2.798	0.053
Interac. P x S	2346.063	9.000	260.674	3.208	0.006
Error SubPlot.	2924.813	36.000	81.245		
Total.....	31189.560	63.000			

General Mean..... 105.619
 Plot Means..... 84.913 106.813 108.613 122.138
 SubPlot Means.... 101.375 110.400 106.250 104.450



PLANNING UNIT — MAFCA

Yield of oats in bushels per acre

Table 1. Experimental Data (Original Values).

=====

A	B	C	Block 1	Block 2	Block 3	Block 4	Block 5	Means
1.	1.	1.	85.000	83.200	57.800	61.600	0.000	71.900
1.	1.	2.	107.600	117.000	87.800	92.600	0.000	101.250
1.	1.	3.	99.000	107.600	81.400	78.800	0.000	91.700
1.	1.	4.	88.000	83.600	56.600	69.400	0.000	74.400
1.	2.	1.	106.600	139.200	90.800	70.200	0.000	101.700
1.	2.	2.	115.200	139.200	84.800	103.800	0.000	110.750
1.	2.	3.	119.600	131.600	82.800	90.800	0.000	106.200
1.	2.	4.	128.200	114.800	88.200	103.200	0.000	108.600
2.	1.	1.	124.600	117.000	89.200	100.600	0.000	107.850
2.	1.	2.	126.800	100.800	90.000	93.400	0.000	102.750
2.	1.	3.	129.000	92.200	125.200	100.600	0.000	111.750
2.	1.	4.	127.200	112.200	105.400	103.600	0.000	112.100
2.	2.	1.	150.800	131.200	108.000	105.400	0.000	123.850
2.	2.	2.	140.600	134.600	115.200	117.000	0.000	126.850
2.	2.	3.	137.600	130.600	91.200	102.000	0.000	115.350
2.	2.	4.	143.200	138.800	113.200	94.800	0.000	122.500

Table 2. Split-Split Analysis of Variance.

=====

SOURCE		S.S.	D.F.	M.S.	F.	Prob.
Blocks		11323.25	3.00	3774.42	8.45	0.06
Factor A	A	6122.94	1.00	6122.94	13.70	0.03
Error	a.....	1340.50	3.00	446.83		
Factor B	B	5047.94	1.00	5047.94	26.38	0.01
Inter	AxB	287.44	1.00	287.44	1.50	0.31
Error	b.....	1148.31	6.00	191.39		
Factor C	C	690.69	3.00	230.23	2.84	0.21
Inter	AxC	1077.63	3.00	359.21	4.44	0.13
Inter	BxC	495.44	3.00	165.15	2.04	0.29
Inter	AxBxC	801.44	3.00	267.15	3.30	0.18
Error	c.....	2913.88	36.00	80.94		
Total		31249.44	63.00			

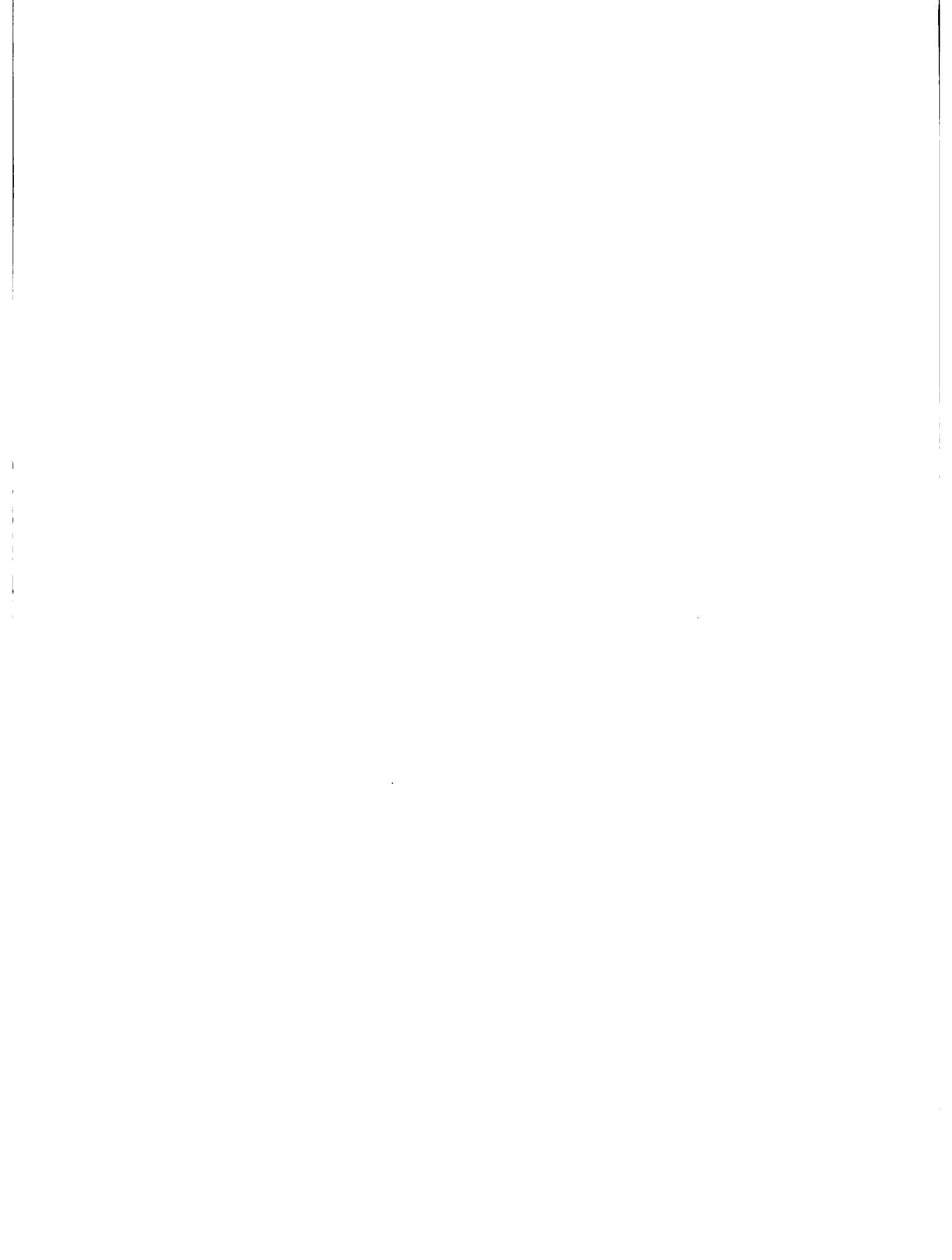


Table 3. Main and Interaction Means.

=====				
General Mean.....	105.59			
Factor A Means...	95.81	115.37		
Factor B Means...	96.71	114.47		
Factor C Means...	101.33	110.40	106.25	104.40
Inter AxB Means.....				
84.81	106.81			
108.61	122.14			
Inter AxC Means.....				
86.80	106.00	98.95		91.50
115.85	114.80	113.55		117.30
Inter BxC Means.....				
89.87	102.00	101.72		93.25
112.78	118.80	110.78		115.55

EXAMPLE:	TREATMENTS	MEANS
	A	4.0
	B	5.0
	C	6.7
	D	7.0
	E	4.7
	F	7.3

ONE WAY ANALYSIS OF VARIANCE

SOURCE	D.F.	S.S.	M.S.	F.
TREATMENTS	5	29.11	5.82	3.88
ERROR	12	18.00	1.50	
TOTAL	17	47.11		

Duncan Multiple Range Test

First Short Course on Communication and Technical Writing.

4.00	4.70	5.00	6.70	7.00	7.30
0.00	0.70	1.00	2.70	3.00	3.30
0.00	0.00	0.30	2.00	2.30	2.60
0.00	0.00	0.00	1.70	2.00	2.30
0.00	0.00	0.00	0.00	0.30	0.60
0.00	0.00	0.00	0.00	0.00	0.30
0.00	0.00	0.00	0.00	0.00	0.00

BSR(1) =
0.00 3.08 3.23 3.33 3.36 3.40

LSR(1) =
0.00 2.18 2.28 2.35 2.38 2.40

Any Difference underscored by an aster is significant (P > .05)
Any Difference not underscored is not significant (P= or < .05)

FIGURE 13.a. Statistical Analysis (Basic Language)

LINEAR REGRESSION

A \ B	< 0	> 0
< 0		
$= 0$		
> 0		



PLANNING UNIT - MANR.

1. LINEAR MODEL: $Y = A + B * X$

Test trial

Table 1. Regression Analysis of Variance

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	46.82	1.00	46.82	34.84
Error.....	9.41	7.00	1.34	
Total.....	56.22	8.00		

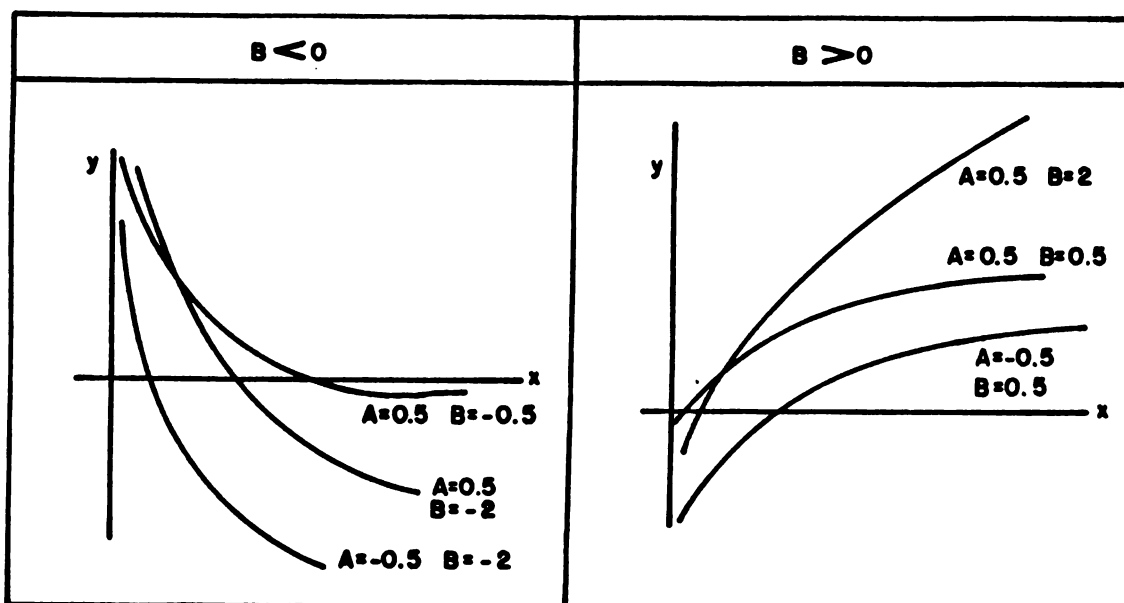
Table 2. Sample Statistics.

Mean of var.... X = 5.000
 Mean of var.... Y = 6.556
 Reliability....R2 = 83.271
 ST. ERROR....SSb = 0.150
 Student's.....T = -5.903
 Constant.....A = 10.972
 Coeffic.....B = -0.883

Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	8.000	10.089	1.685	8.404	11.774
2.000	10.000	9.206	1.401	7.805	10.606
3.000	9.000	8.322	1.156	7.166	9.478
4.000	8.000	7.439	0.980	6.459	8.419
5.000	7.000	6.556	0.914	5.642	7.469
6.000	6.000	5.672	0.980	4.692	6.652
7.000	6.000	4.789	1.156	3.633	5.945
8.000	3.000	3.906	1.401	2.505	5.306
9.000	2.000	3.022	1.685	1.337	4.707



SEMILOG REGRESSION



PLANNING UNIT - MANR.

2. SEMILOG MODEL: $Y = A + B * LN(X)$

Test Trial

Table 1. Regression Analysis of Variance

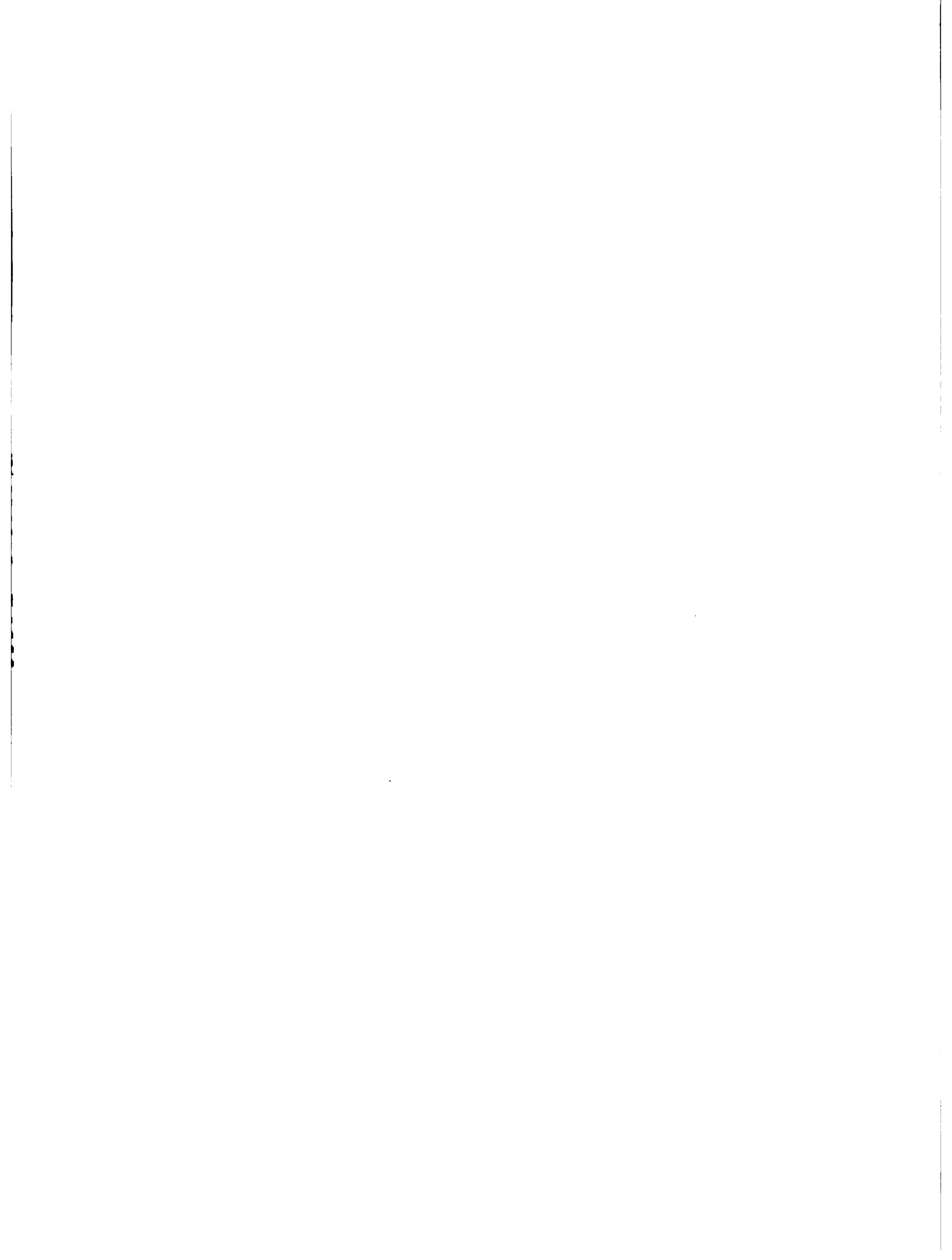
Var. Source	S.S.	D.F.	M.S.	F.
Regression....	33.01	1.00	33.01	9.96
Error.....	23.21	7.00	3.32	
Total.....	56.22	8.00		

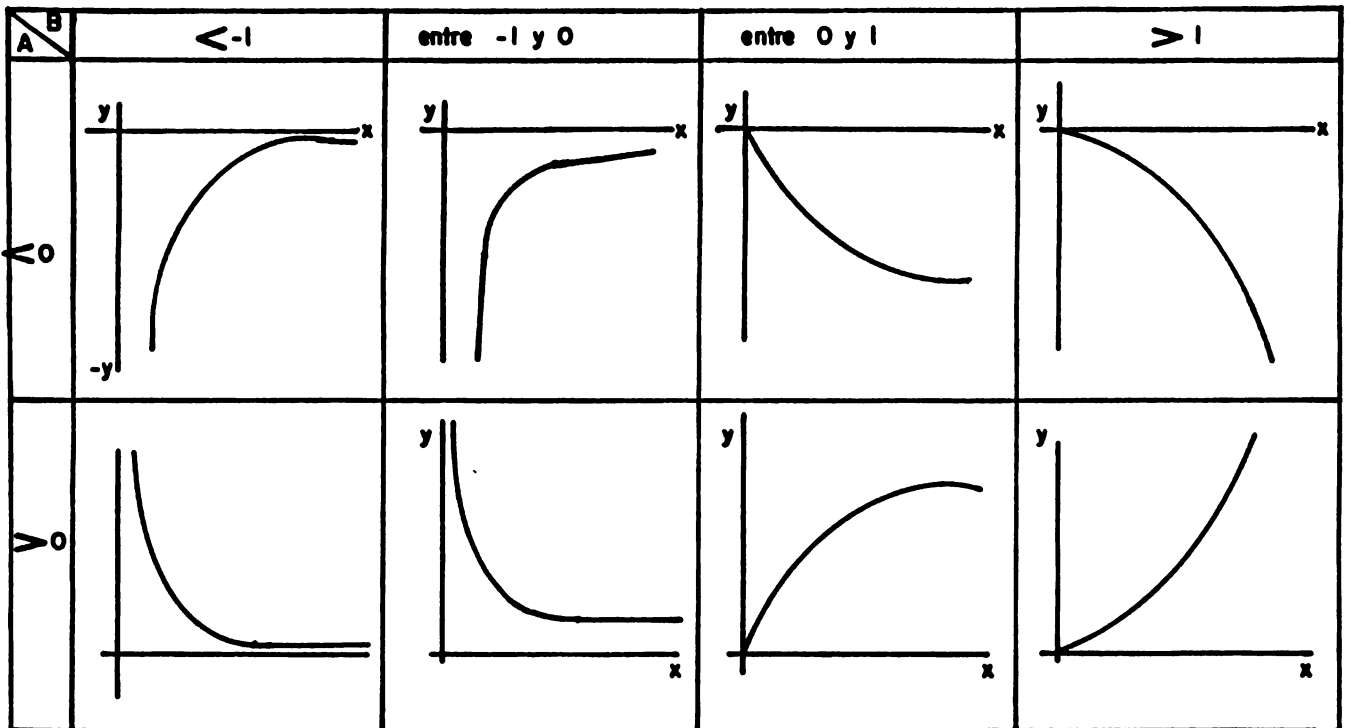
Table 2. Sample Statistics.

Mean of var.... X =	1.422
Mean of var.... Y =	6.556
Reliability....R2 =	58.719
ST. ERROR....SSb =	0.895
Student's.....T =	-3.155
Constant.....A =	10.573
Coeffic.....B =	-2.824

Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
0.000	8.000	10.573	3.336	7.237	13.909
0.693	10.000	8.615	2.108	6.507	10.723
1.099	9.000	7.470	1.591	5.879	9.061
1.386	8.000	6.658	1.438	5.220	8.095
1.609	7.000	6.027	1.489	4.538	7.516
1.792	6.000	5.512	1.635	3.878	7.147
1.946	6.000	5.077	1.813	3.264	6.890
2.079	3.000	4.700	1.999	2.701	6.699
2.197	2.000	4.367	2.180	2.188	6.547



LOGARITHM REGRESSION



PLANNING UNIT - MANR.

3. LOGARITH MODEL: $Y = A * X ** B$

Test Trial

Table 1. Regression Analysis of Variance

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	1.17	1.00	1.17	7.26
Error.....	1.13	7.00	0.16	
Total.....	2.30	8.00		

Table 2. Sample Statistics.

Mean of var.... X =	1.422
Mean of var.... Y =	1.776
Reliability....R2 =	50.909
ST. ERROR....SSb =	0.197
Student's.....T =	-2.694
Constant.....A =	2.532
Coeffic.....B =	-0.532

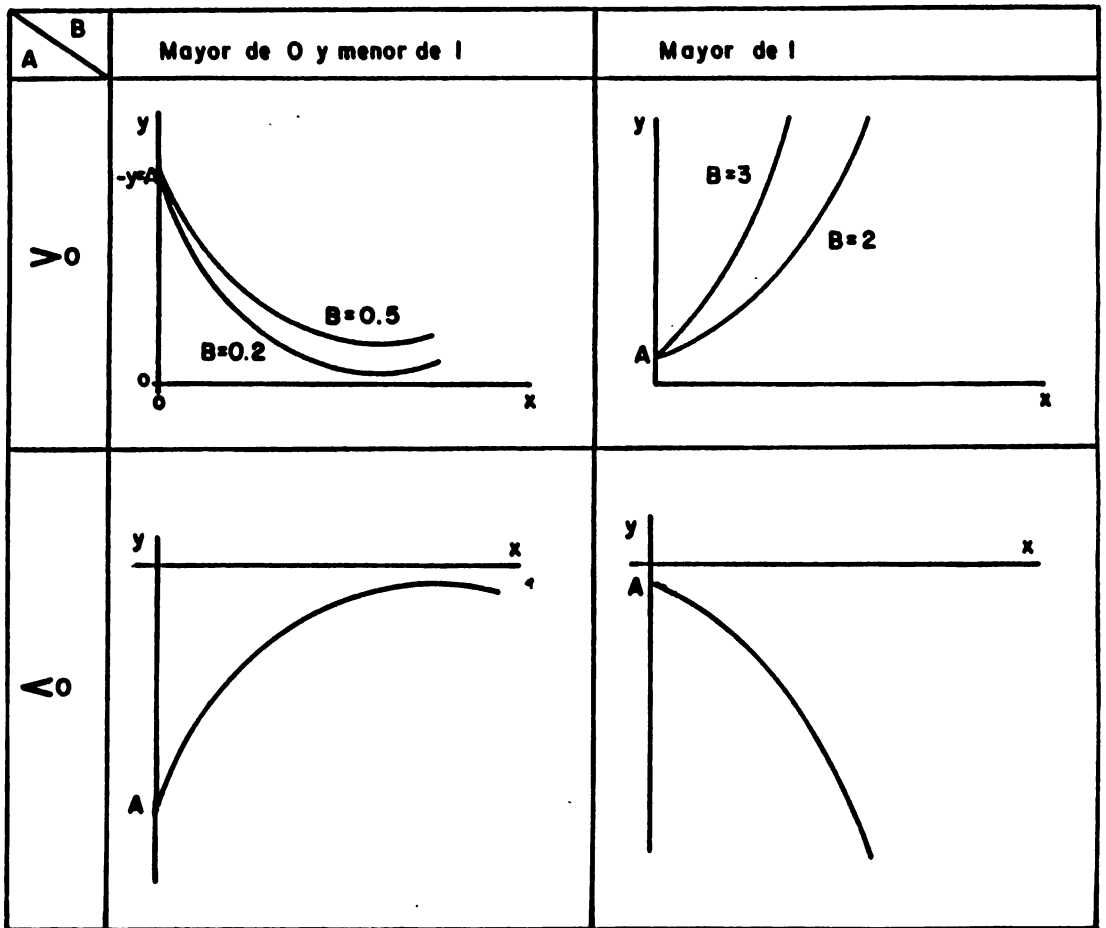
Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
0.000	2.079	2.532	0.736	1.796	3.268
0.693	2.303	2.163	0.465	1.699	2.628
1.099	2.197	1.948	0.351	1.597	2.299
1.386	2.079	1.795	0.317	1.478	2.112
1.609	1.946	1.676	0.328	1.348	2.004
1.792	1.792	1.579	0.360	1.219	1.940
1.946	1.792	1.497	0.400	1.097	1.897
2.079	1.099	1.426	0.441	0.985	1.867
2.197	0.693	1.363	0.481	0.883	1.844

.....Y - HATS(antilogs) FOLLOWS NEXT LINES:
 12.6 8.7 7.0 6.0 5.3 4.9 4.5 4.2 3.9



GEOMETRIC REGRESSION



PLANNING UNIT - MANR.

4. GEOMETRIC MODEL: $Y = A * B ** X$

Test Trial

Table 1. Regression Analysis of Variance

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	1.75	1.00	1.75	22.45
Error.....	0.55	7.00	0.08	
Total.....	2.30	8.00		

Table 2. Sample Statistics.

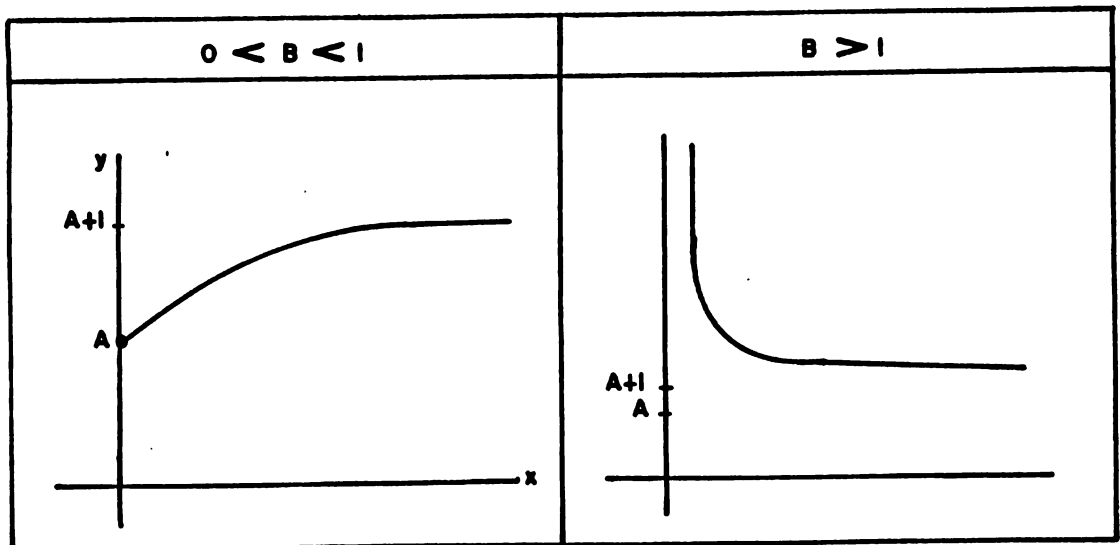
Mean of var.... X =	5.000
Mean of var.... Y =	1.776
Reliability....R2 =	76.229
ST. ERROR.....SSb =	0.036
Student's.....T =	-4.738
Constant.....A =	2.630
Coeffic.....B =	-0.171

Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	2.079	2.459	0.406	2.053	2.865
2.000	2.303	2.288	0.338	1.951	2.626
3.000	2.197	2.117	0.279	1.839	2.396
4.000	2.079	1.946	0.236	1.710	2.183
5.000	1.946	1.776	0.220	1.555	1.996
6.000	1.792	1.605	0.236	1.368	1.841
7.000	1.792	1.434	0.279	1.155	1.712
8.000	1.099	1.263	0.338	0.925	1.600
9.000	0.693	1.092	0.406	0.686	1.498

.....Y - HATS(antilog) FOLLOWS NEXT LINES:
 11.7 9.9 8.3 7.0 5.9 5.0 4.2 3.5 3.0



INVERSE REGRESSION



PLANNING UNIT - MANR.

5. INVERSE MODEL: $Y = A + B / X$

Test Trial

Table 1. Regression Analysis of Variance

=====

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	16.83	1.00	16.83	2.99
Error.....	39.39	7.00	5.63	
Total.....	56.22	8.00		

Table 2. Sample Statistics.

=====

Mean of var.... X =	0.314
Mean of var.... Y =	6.556
Reliability....R ² =	29.936
ST. ERROR....SSb =	2.941
Student's.....T =	1.729
Constant.....A =	4.957
Coeffic.....B =	5.086

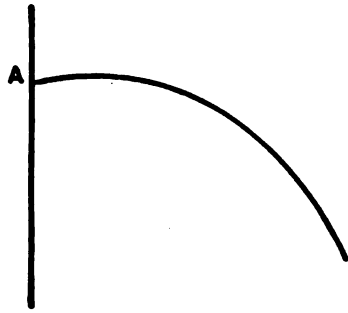
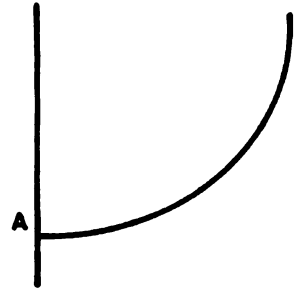
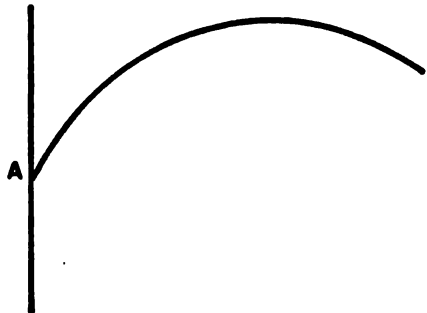
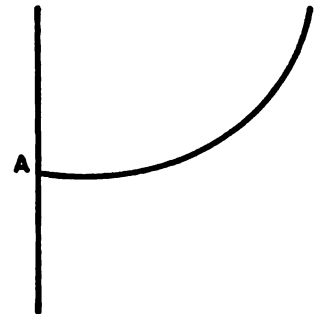
Table 3. Observed and Expected Values.

=====

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	8.000	10.043	5.123	4.920	15.166
0.500	10.000	7.500	2.273	5.227	9.773
0.333	9.000	6.652	1.875	4.777	8.527
0.250	8.000	6.228	1.923	4.305	8.151
0.200	7.000	5.974	2.032	3.942	8.006
0.167	6.000	5.804	2.134	3.671	7.938
0.143	6.000	5.683	2.218	3.465	7.901
0.125	3.000	5.593	2.287	3.305	7.880
0.111	2.000	5.522	2.344	3.178	7.866



CUADRATIC REGRESSION

B \ C	< 0	> 0
< 0		
> 0		

PLANNING UNIT - MANR.

1. CUADRATIC: $Y = A + B * X + C * X ** 2$

Test Trial February 6 1986

Table 1. Regression Analysis of Variance

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	52.64	2.00	26.32	44.02
Error.....	3.59	6.00	0.60	
Total.....	56.22	8.00		

Table 2. Sample Statistics.

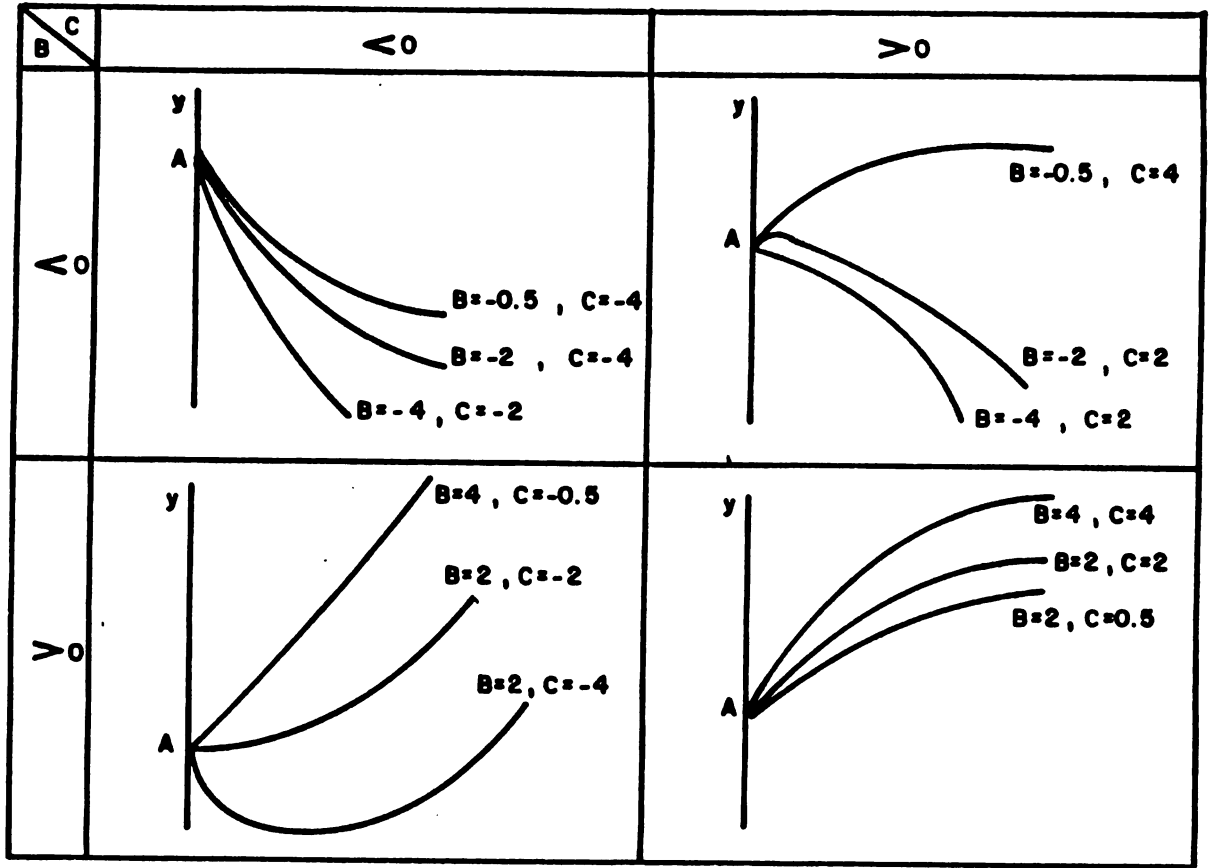
Mean of var.... X =	5.000
Mean of var.... Y =	6.556
Mean of Trans.. Z =	31.667
Reliability....R2 =	93.620
ST. ERROR.....SSb =	0.452
ST. ERROR.....SSc =	0.044
Student's.....Tb =	1.087
Student's.....Tc =	-3.120
Constant.....A =	8.452
Coeffic.....B =	0.491
Coeffic.....C =	-0.137
COVARIANCE.....bc =	0.019

Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	8.000	8.806	1.538	7.268	10.344
2.000	10.000	8.885	0.999	7.886	9.884
3.000	9.000	8.689	0.848	7.841	9.537
4.000	8.000	8.218	0.911	7.306	9.129
5.000	7.000	7.472	0.956	6.516	8.428
6.000	6.000	6.451	0.911	5.540	7.362
7.000	6.000	5.155	0.848	4.307	6.003
8.000	3.000	3.585	0.999	2.586	4.584
9.000	2.000	1.739	1.538	0.202	3.277



ROOT SQUARE REGRESSION



PLANNING UNIT - MANR.

2. ROOT SQ: $Y = A + B * X + C * SQ(X)$

Test Trial February 6 1986

Table 1. Regression Analysis of Variance

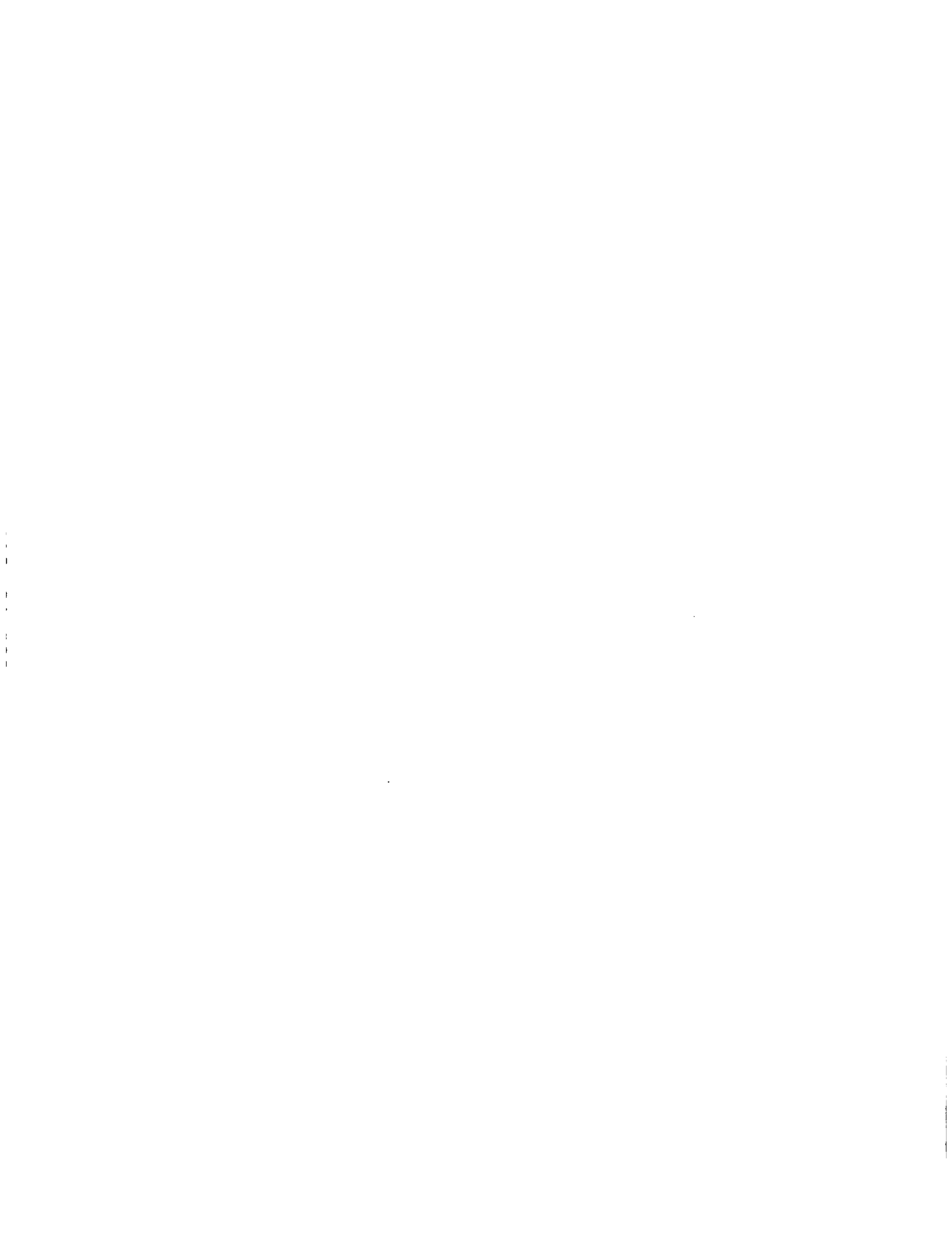
Var. Source	S.S.	D.F.	M.S.	F.
Regression....	53.61	2.00	26.81	61.68
Error.....	2.61	6.00	0.43	
Total.....	56.22	8.00		

Table 2. Sample Statistics.

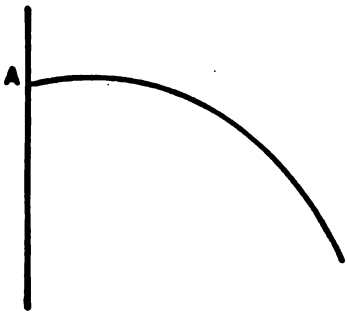
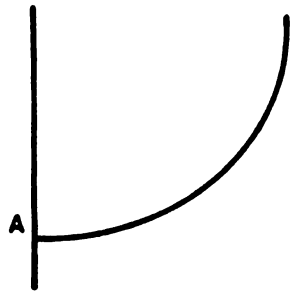
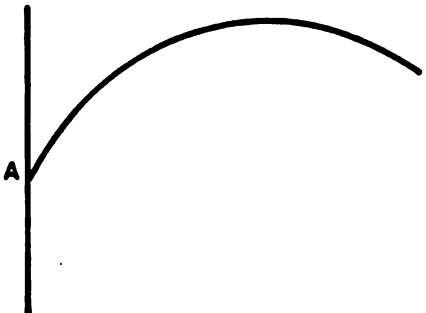
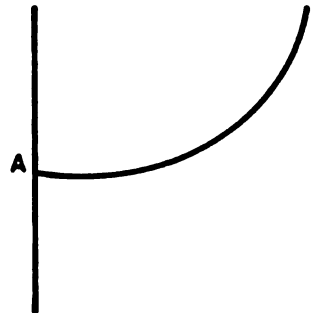
Mean of var.... X =	5.000
Mean of var.... Y =	6.556
Mean of Trans.. Z =	2.145
Reliability....R2 =	95.362
ST. ERROR.....SSb =	0.597
ST. ERROR.....SSc =	2.442
Student's.....Tb =	-5.394
Student's.....Tc =	3.955
Constant.....A =	1.940
Coeffic.....B =	-3.221
Coeffic.....C =	9.658
COVARIANCE.....bc =	1.443

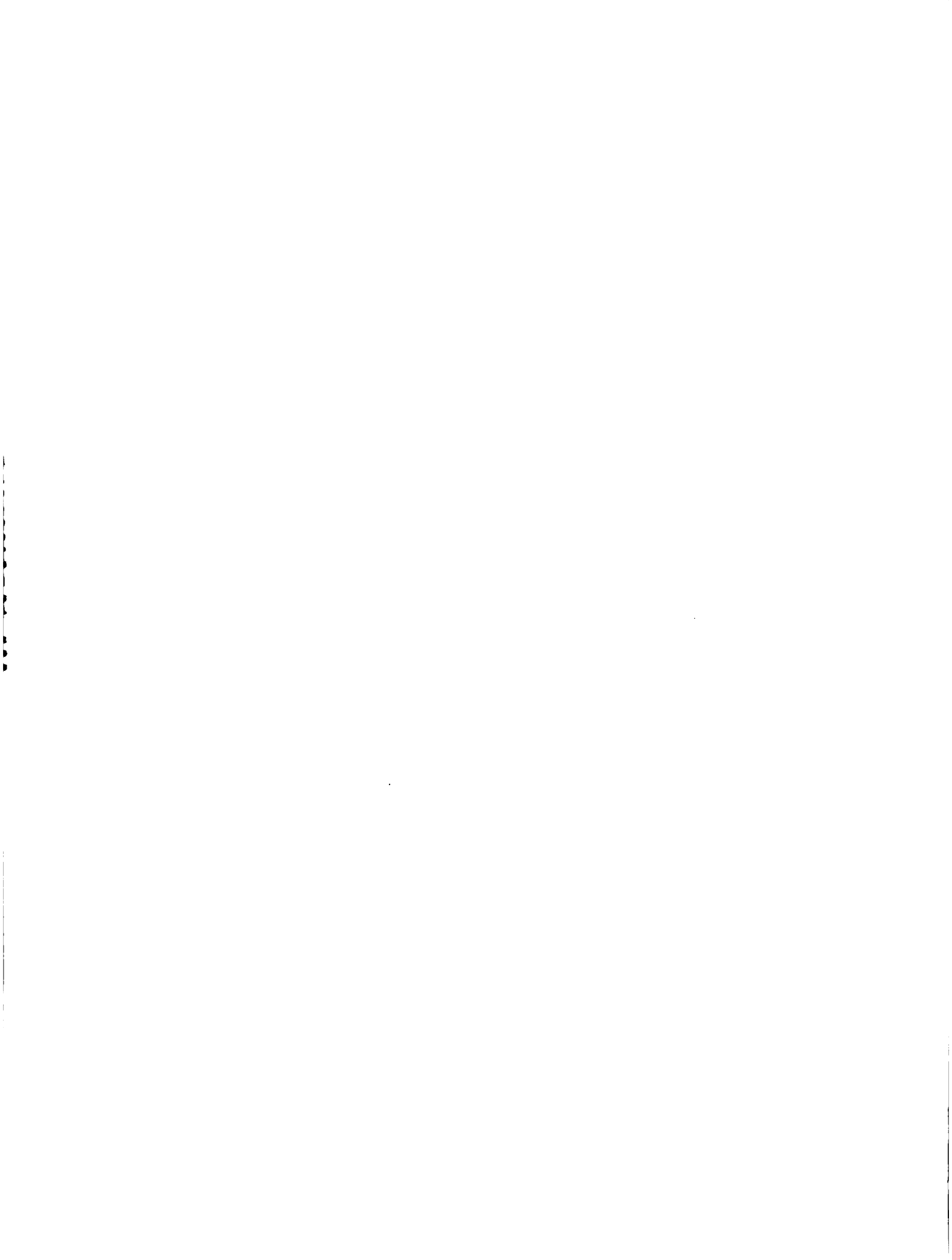
Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	8.000	8.378	1.450	6.928	9.828
2.000	10.000	9.158	0.825	8.333	9.983
3.000	9.000	9.007	0.801	8.206	9.809
4.000	8.000	8.375	0.817	7.557	9.192
5.000	7.000	7.434	0.765	6.669	8.199
6.000	6.000	6.275	0.687	5.588	6.961
7.000	6.000	4.950	0.687	4.262	5.637
8.000	3.000	3.494	0.863	2.631	4.356
9.000	2.000	1.930	1.200	0.730	3.130

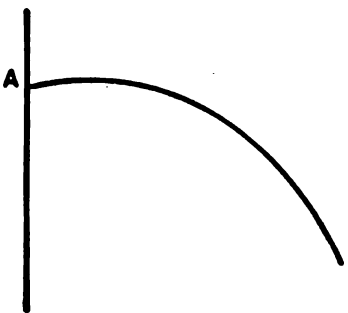
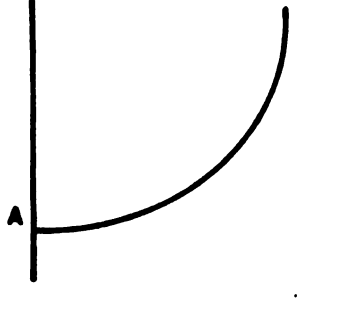
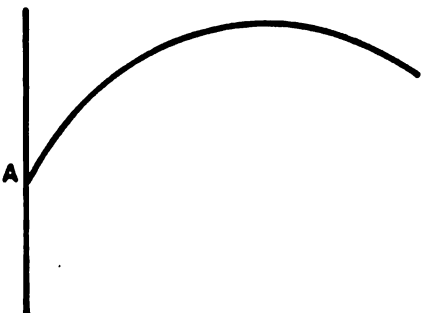
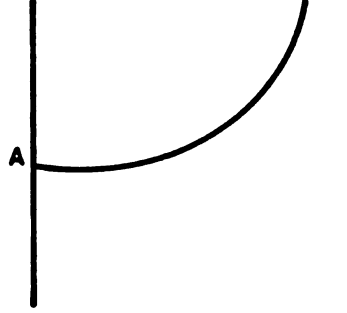


QUADRATIC REGRESSION

B \ C	< 0	> 0
< 0		
> 0		

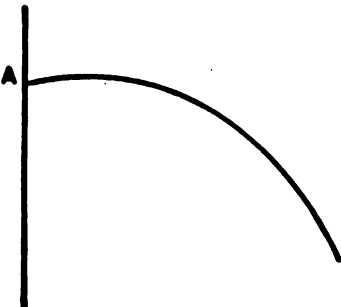
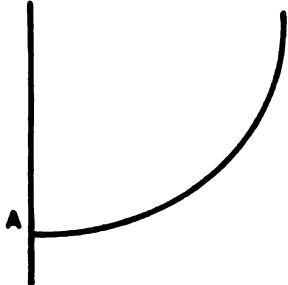
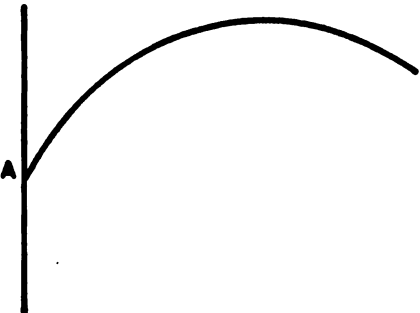
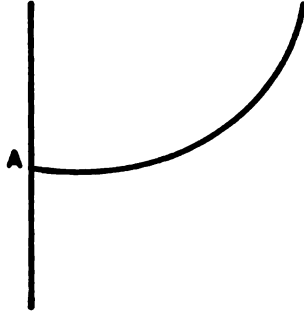


CUADRATIC REGRESSION

B \ C	< 0	> 0
< 0		
> 0		

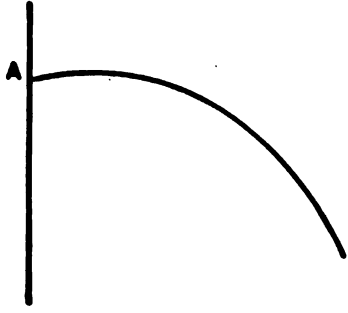
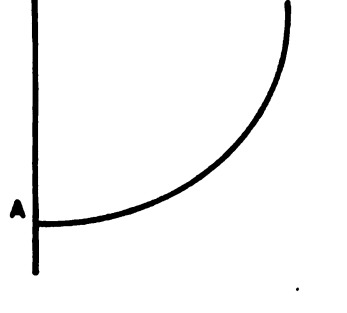
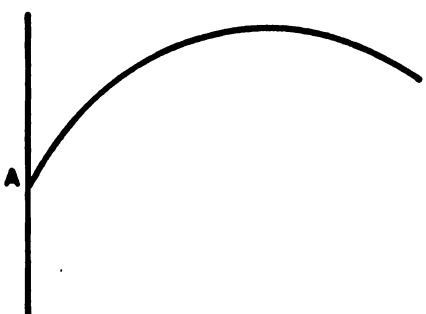
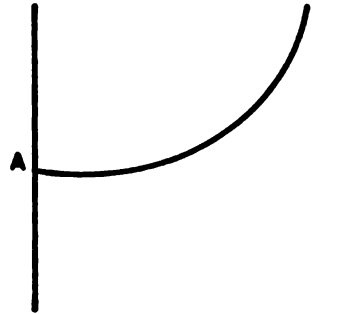


CUADRATIC REGRESSION

$B \setminus C$	< 0	> 0
< 0		
> 0		

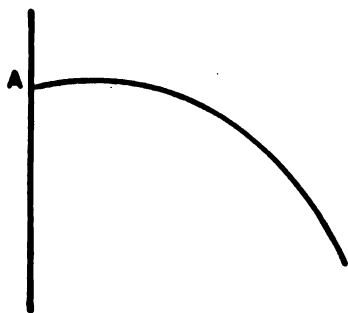
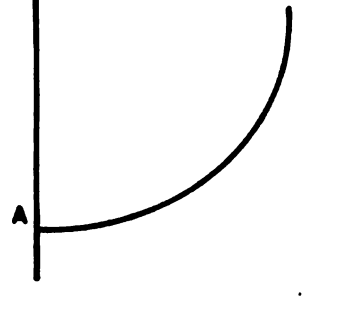
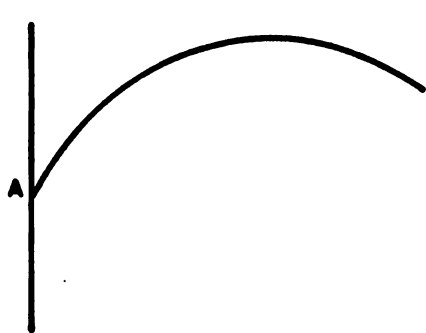
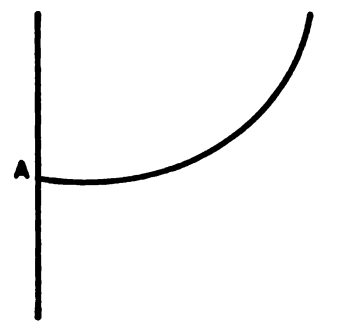


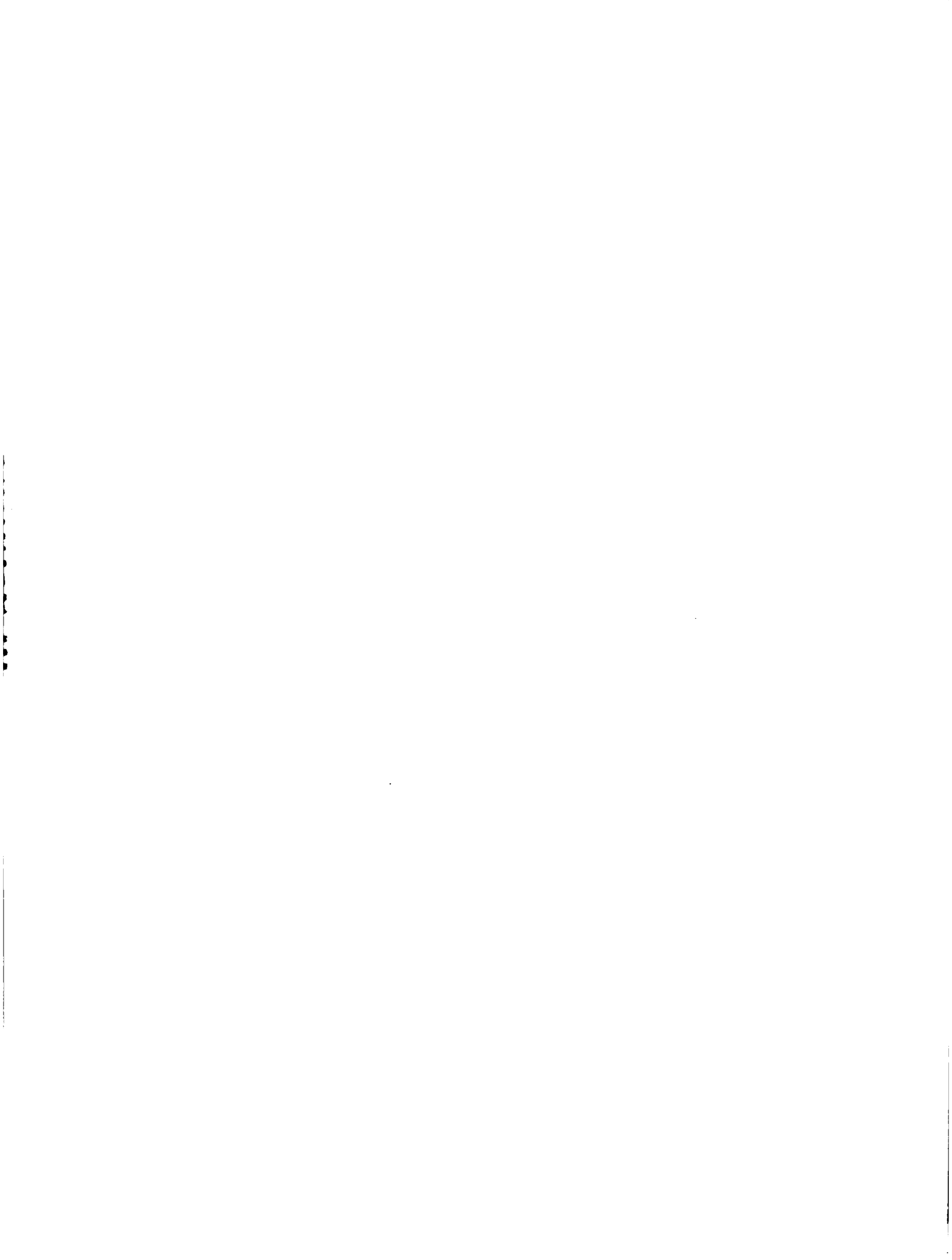
CUADRATIC REGRESSION

B \ C	< 0	> 0
< 0	 <p>A graph showing a downward-opening parabola. The vertex is in the first quadrant. The parabola intersects the x-axis at two points, one positive and one negative. The y-axis is labeled 'A' at a positive value.</p>	 <p>A graph showing an upward-opening parabola. The vertex is in the third quadrant. The parabola intersects the x-axis at two points, one positive and one negative. The y-axis is labeled 'A' at a negative value.</p>
> 0	 <p>A graph showing a downward-opening parabola. The vertex is in the second quadrant. The parabola intersects the x-axis at two points, one positive and one negative. The y-axis is labeled 'A' at a negative value.</p>	 <p>A graph showing an upward-opening parabola. The vertex is in the fourth quadrant. The parabola intersects the x-axis at two points, one positive and one negative. The y-axis is labeled 'A' at a negative value.</p>

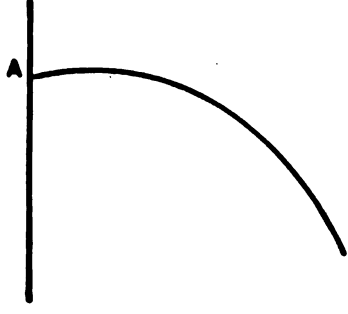
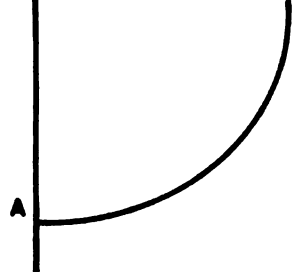
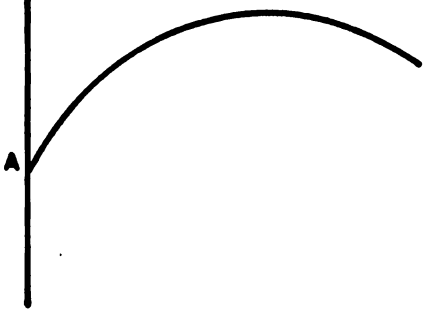
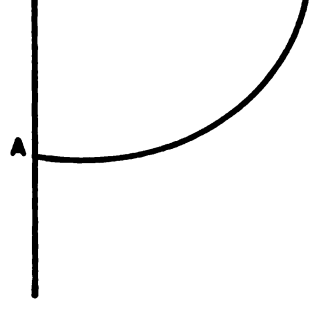


CUADRATIC REGRESSION

B \ C	< 0	> 0
< 0		
> 0		



CUADRATIC REGRESSION

$B \setminus C$	\wedge_0	\vee_0
\wedge_0		
\vee_0		

PLANNING UNIT - MANR.

1. CUADRATIC: Y = A + B * X + C * X ** 2

Test Trial February 6 1986

Table 1. Regression Analysis of Variance

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	52.64	2.00	26.32	44.02
Error.....	3.59	6.00	0.60	
Total.....	56.22	8.00		

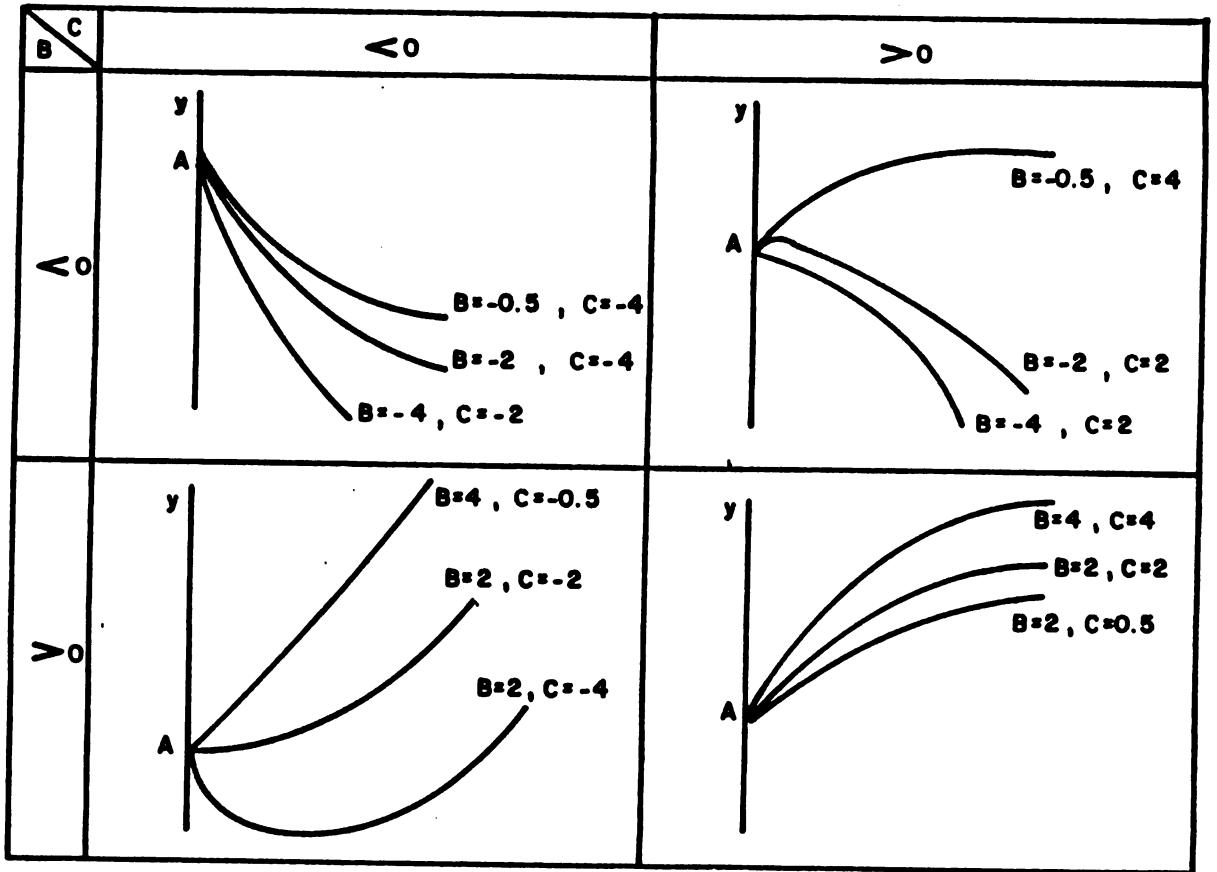
Table 2. Sample Statistics.

Mean of var.... X =	5.000
Mean of var.... Y =	6.556
Mean of Trans.. Z =	31.667
Reliability....R2 =	93.620
ST. ERROR....SSb =	0.452
ST. ERROR....SSc =	0.044
Student's.....Tb =	1.087
Student's.....Tc =	-3.120
Constant.....A =	8.452
Coeffic.....B =	0.491
Coeffic.....C =	-0.137
COVARIANCE....bc =	0.019

Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	8.000	8.806	1.538	7.268	10.344
2.000	10.000	8.885	0.999	7.886	9.884
3.000	9.000	8.689	0.848	7.841	9.537
4.000	8.000	8.218	0.911	7.306	9.129
5.000	7.000	7.472	0.956	6.516	8.428
6.000	6.000	6.451	0.911	5.540	7.362
7.000	6.000	5.155	0.848	4.307	6.003
8.000	3.000	3.585	0.999	2.586	4.584
9.000	2.000	1.739	1.538	0.202	3.277

ROOT SQUARE REGRESSION



PLANNING UNIT - MANR.

2. ROOT SQ: $Y = A + B * X + C * SQ(X)$

Test Trial February 6 1986

Table 1. Regression Analysis of Variance

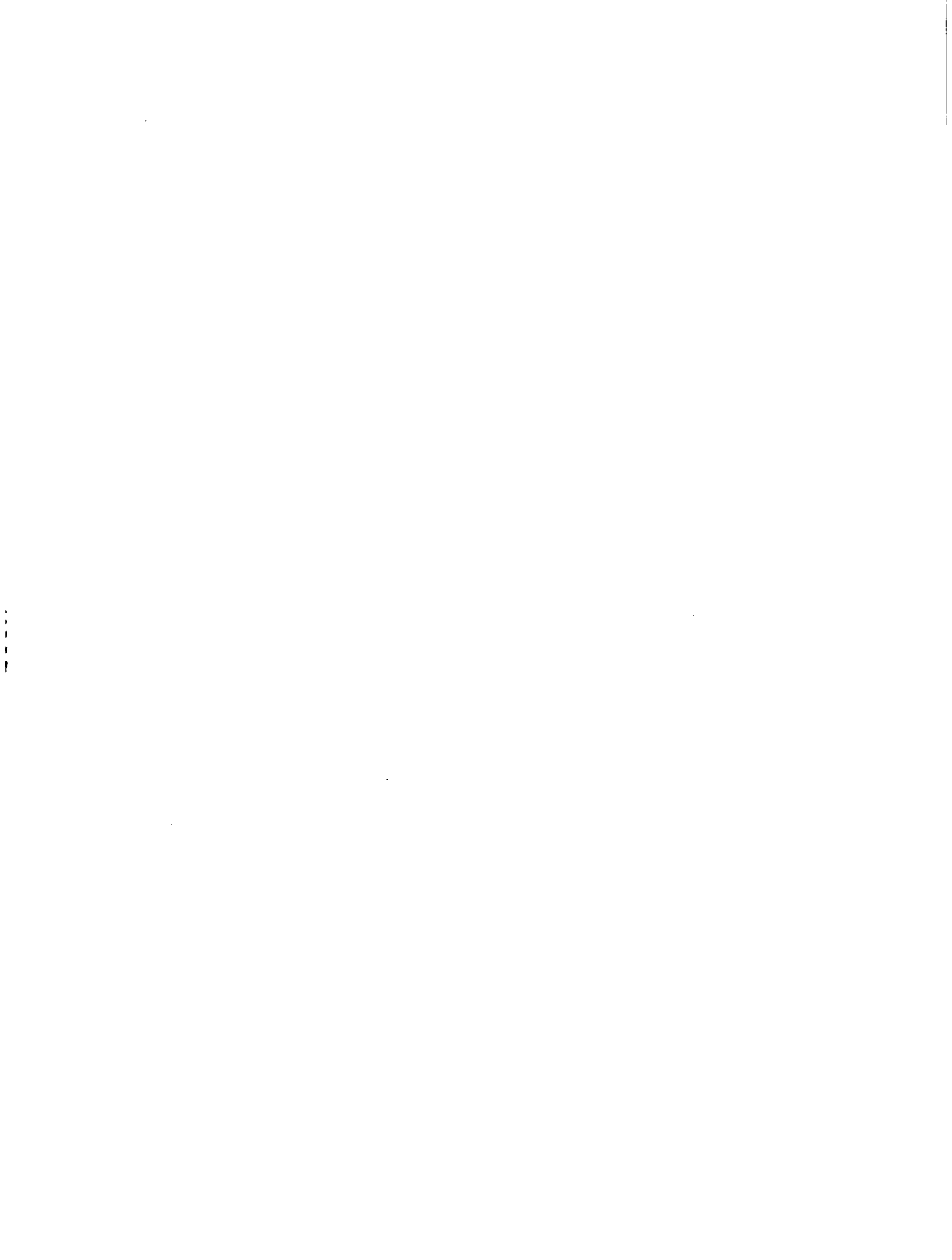
Var. Source	S.S.	D.F.	M.S.	F.
Regression....	53.61	2.00	26.81	61.68
Error.....	2.61	6.00	0.43	
Total.....	56.22	8.00		

Table 2. Sample Statistics.

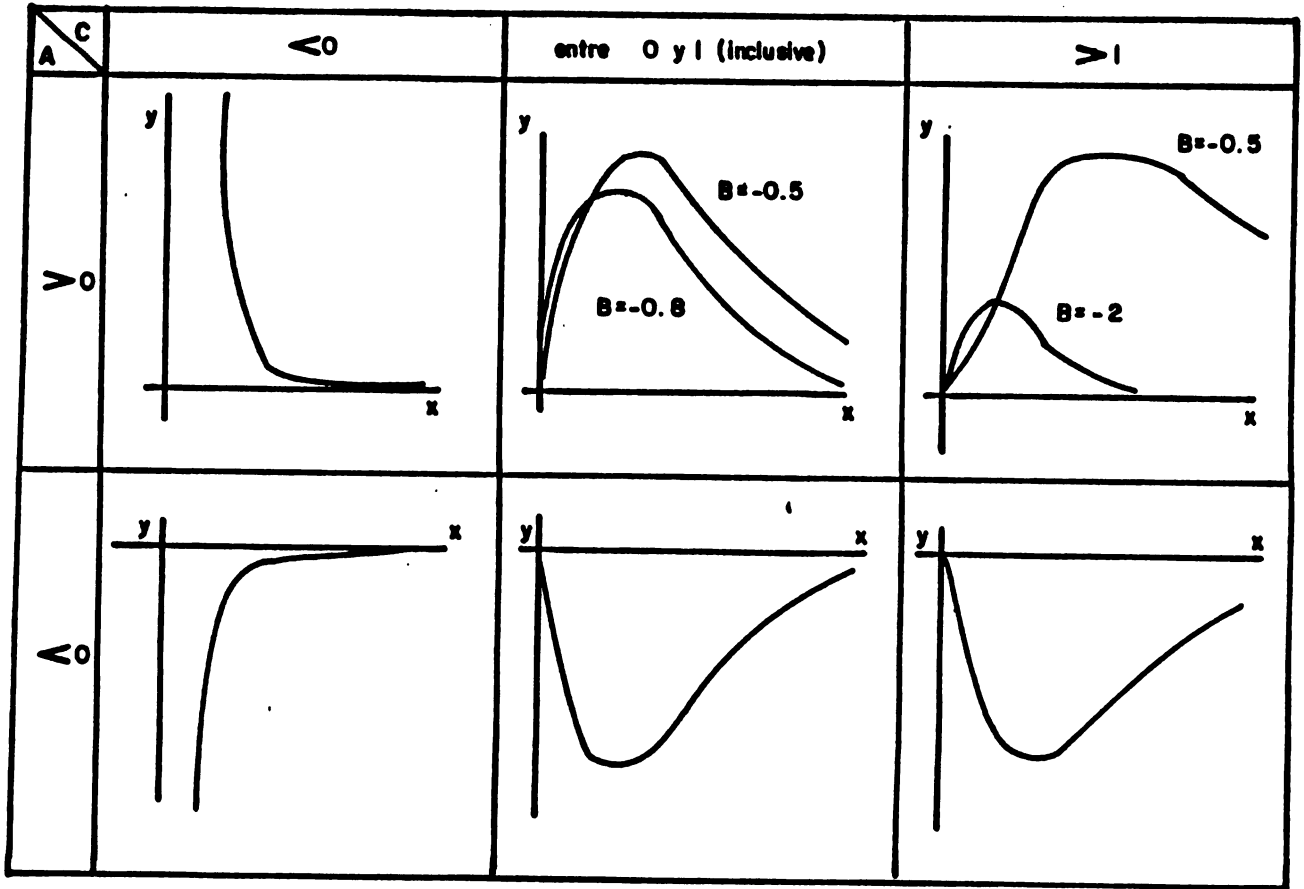
Mean of var.... X =	5.000
Mean of var.... Y =	6.556
Mean of Trans.. Z =	2.145
Reliability....R2 =	95.362
ST. ERROR.....SSb =	0.597
ST. ERROR.....SSc =	2.442
Student's.....Tb =	-5.394
Student's.....Tc =	3.955
Constant.....A =	1.940
Coeffic.....B =	-3.221
Coeffic.....C =	9.658
COVARIANCE.....bc =	1.443

Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	8.000	8.378	1.450	6.928	9.828
2.000	10.000	9.158	0.825	8.333	9.983
3.000	9.000	9.007	0.801	8.206	9.809
4.000	8.000	8.375	0.817	7.557	9.192
5.000	7.000	7.434	0.765	6.669	8.199
6.000	6.000	6.275	0.687	5.588	6.961
7.000	6.000	4.950	0.687	4.262	5.637
8.000	3.000	3.494	0.863	2.631	4.356
9.000	2.000	1.930	1.200	0.730	3.130



GAMMA REGRESSION



PLANNING UNIT - MANR.

3. GAMMA: $Y = A * X ** B * EXP(C * X)$

Test Trial February 6 1986

Table 1. Regression Analysis of Variance

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	2.13	2.00	1.07	37.70
Error.....	0.17	6.00	0.03	
Total.....	2.30	8.00		

Table 2. Sample Statistics.

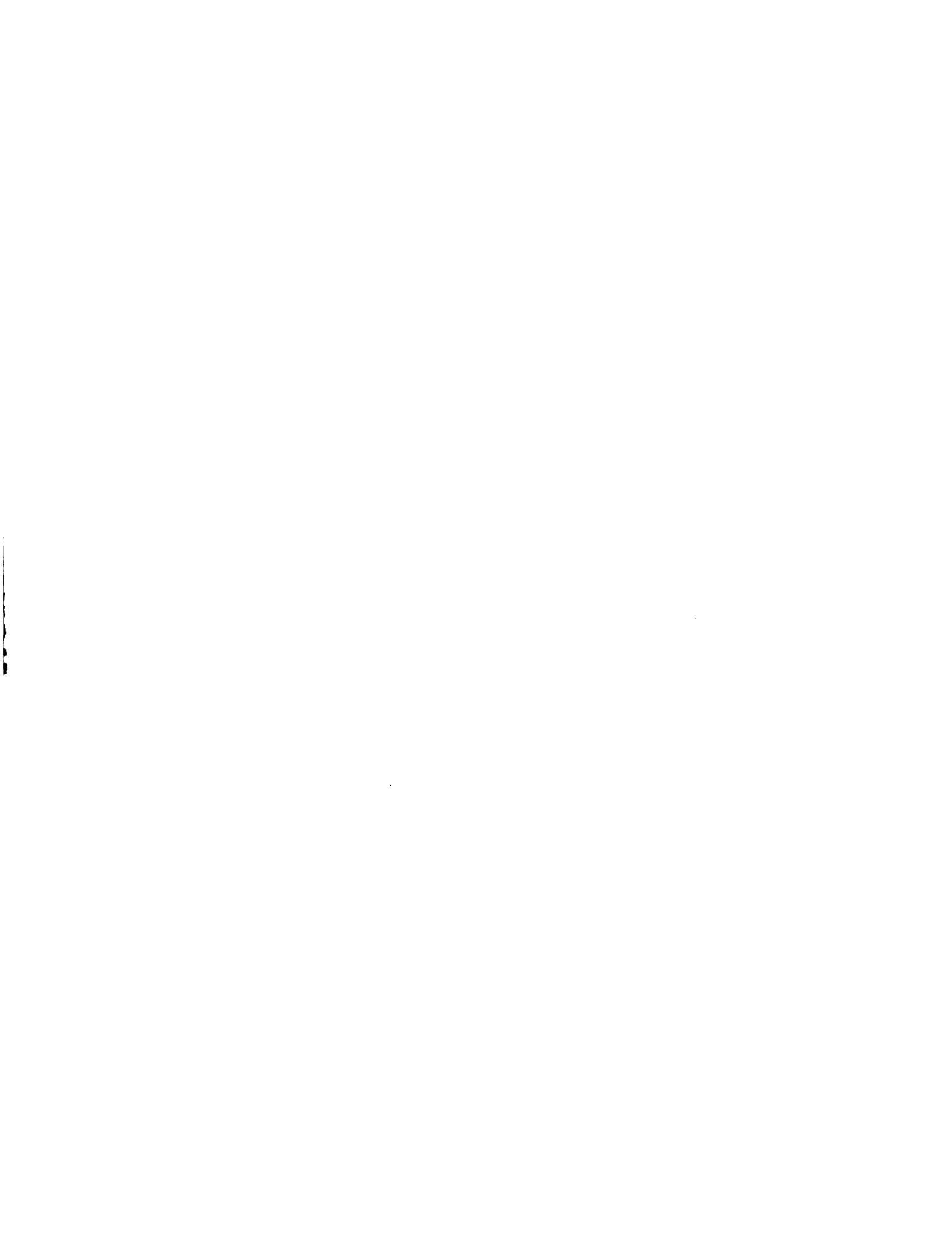
Mean of var.... X =	5.000
Mean of var.... Y =	1.776
Mean of Trans.. Z =	1.422
Reliability....R2 =	92.629
ST. ERROR....SSb =	0.073
ST. ERROR....SSc =	0.278
Student's.....Tb =	-5.827
Student's.....Tc =	3.654
Constant.....A =	2.459
Coeffic.....B =	-0.426
Coeffic.....C =	1.017
COVARIANCE....bc =	0.019

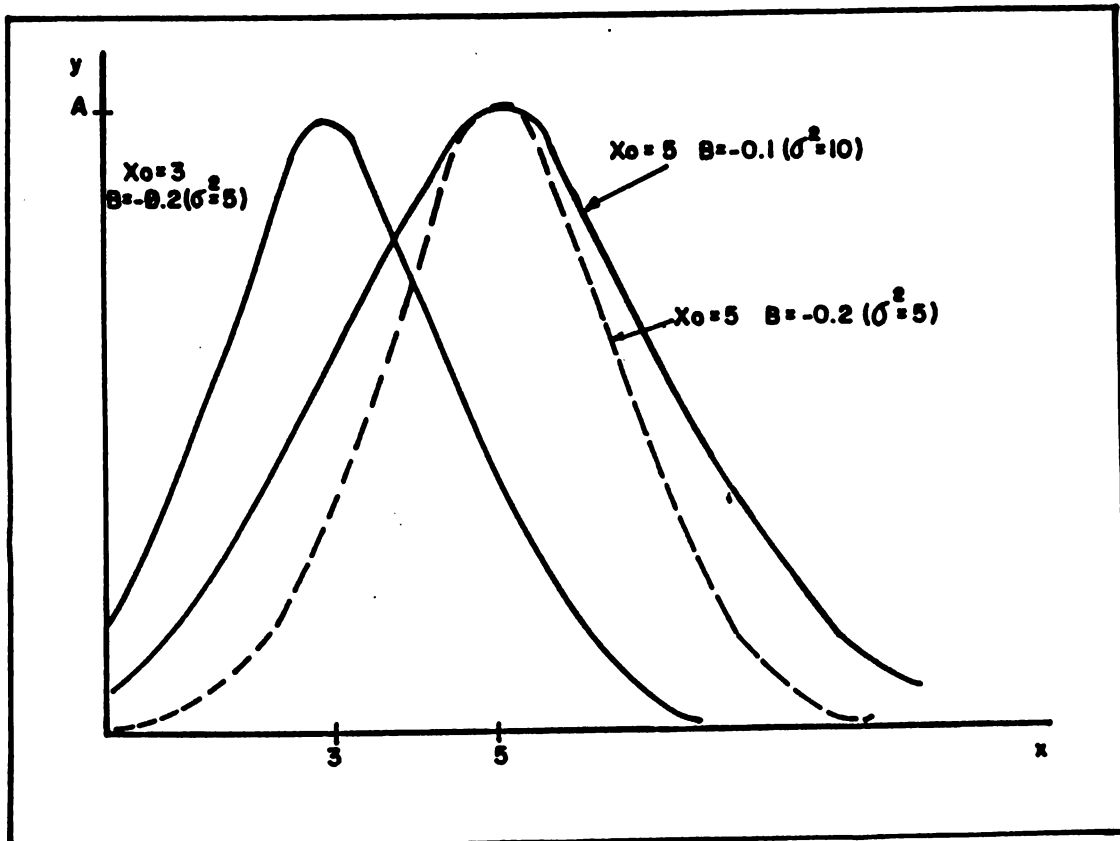
Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
1.000	2.079	2.033	0.381	1.652	2.414
2.000	2.303	2.312	0.211	2.101	2.523
3.000	2.197	2.298	0.212	2.087	2.510
4.000	2.079	2.165	0.207	1.957	2.372
5.000	1.946	1.966	0.187	1.779	2.153
6.000	1.792	1.725	0.168	1.557	1.893
7.000	1.792	1.456	0.174	1.282	1.630
8.000	1.099	1.166	0.220	0.946	1.386
9.000	0.693	0.860	0.297	0.563	1.156

.....Y - HATS (antilog) FOLLOWS NEXT LINE :

7.6 10.1 10.0 8.7 7.1 5.6 4.3 3.2 2.4



BETA REGRESSION

PLANNING UNIT - MANR.

4. BETA: $Y = A * X ** B * (10 - X) ** C$

Test Trial February 6 1986

Table 1. Regression Analysis of Variance

=====

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	51.46	2.00	25.73	32.39
Error.....	4.77	6.00	0.79	
Total.....	56.22	8.00		

Table 2. Sample Statistics.

=====

Mean of var.... X =	1.422
Mean of var.... Y =	6.556
Mean of Trans.. Z =	1.422
Reliability....R2 =	91.524
ST. ERROR....SSb =	0.817
ST. ERROR....SSc =	0.817
Student's.....Tb =	0.610
Student's.....Tc =	4.819
Constant.....A =	0.248
Coeffic.....B =	0.498
Coeffic.....C =	3.936
COVARIANCE....bc =	-0.563

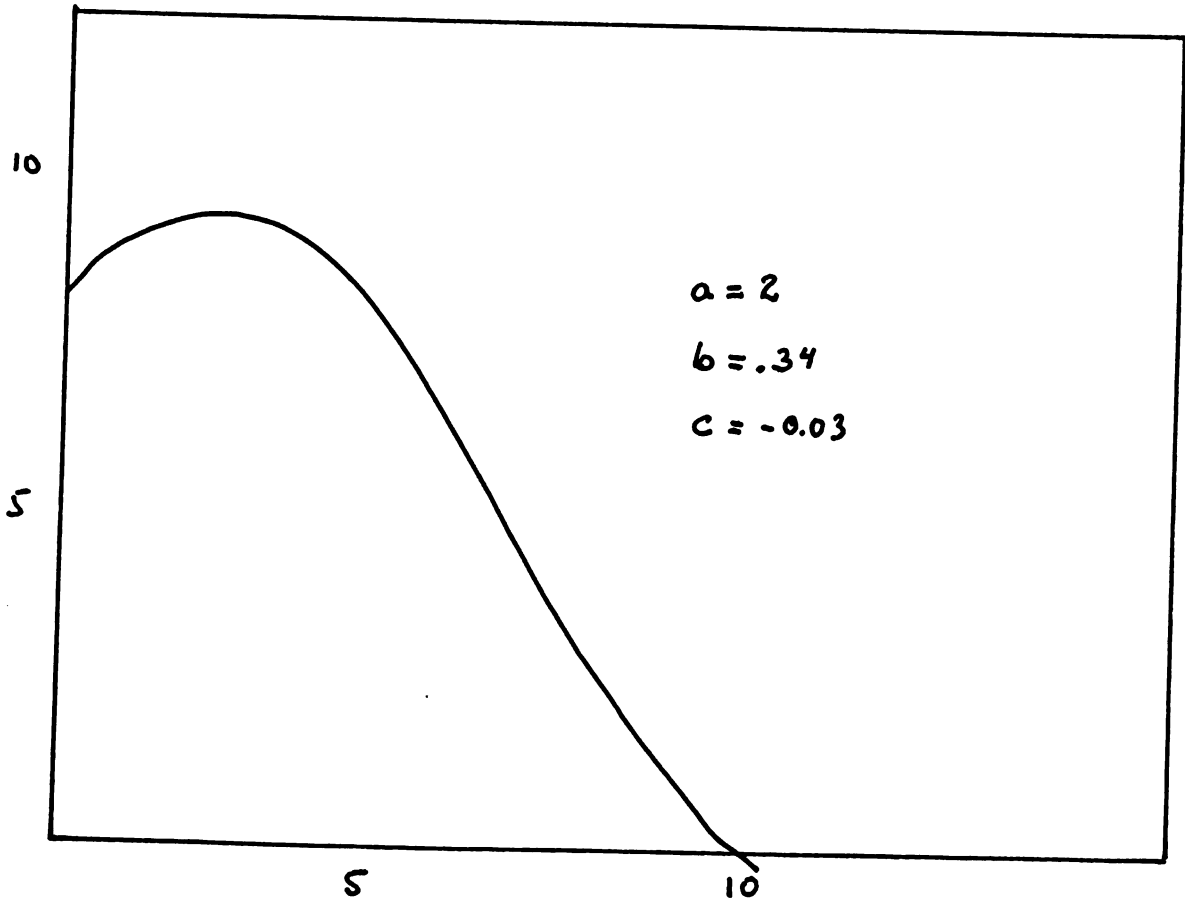
Table 3. Observed and Expected Values.

=====

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
0.000	8.000	8.897	1.892	7.005	10.788
0.693	10.000	8.779	1.071	7.708	9.849
1.099	9.000	8.455	0.948	7.507	9.403
1.386	8.000	7.991	0.994	6.997	8.986
1.609	7.000	7.385	1.022	6.363	8.407
1.792	6.000	6.597	0.994	5.603	7.592
1.946	6.000	5.542	0.948	4.594	6.490
2.079	3.000	4.012	1.071	2.941	5.083
2.197	2.000	1.342	1.892	-0.549	3.234

.....Y - HATS (antilogs) FOLLOWS NEXT LINE :

7308.96493.34698.02955.41611.4 733.1 255.1 55.3 3.8

ROYLEIGH REGRESSION

PLANNING UNIT - MANR.

5. ROYLEIGH: Y = A * X * EXP (B * X ** 2)

Test Trial February 6 1986

Table 1. Regression Analysis of Variance

Var. Source	S.S.	D.F.	M.S.	F.
Regression....	2.19	2.00	1.10	59.91
Error.....	0.11	6.00	0.02	
Total.....	2.30	8.00		

Table 2. Sample Statistics.

Mean of var.... X =	1.422
Mean of var.... Y =	1.776
Mean of Trans.. Z =	31.667
Reliability....R2 =	95.232
ST. ERROR....SSb =	0.135
ST. ERROR....SSc =	0.003
Student's.....Tb =	2.554
Student's.....Tc =	-7.468
Constant.....A =	2.102
Coeffic.....B =	0.344
Coeffic.....C =	-0.026
COVARIANCE....bc =	0.000

Table 3. Observed and Expected Values.

Var X	Var Y	Y Hat	Error	Confidence Limits	
				Lower	Upper
0.000	2.079	2.077	0.297	1.780	2.373
0.693	2.303	2.238	0.164	2.074	2.402
1.099	2.197	2.249	0.157	2.092	2.406
1.386	2.079	2.167	0.165	2.003	2.332
1.609	1.946	2.012	0.159	1.853	2.171
1.792	1.792	1.791	0.143	1.648	1.934
1.946	1.792	1.509	0.139	1.369	1.648
2.079	1.099	1.168	0.175	0.992	1.343
2.197	0.693	0.770	0.257	0.513	1.026

.....Y - HATS (antilog) FOLLOWS NEXT LINE :

8.0 9.4 9.5 8.7 7.5 6.0 4.5 3.2 2.2



STATISTICAL PACKAGE**Data Definition**

- Up to 32,600 cases with 200 variables
- Reads ASCII files
- Variable & Value Labels
- Missing Values
- Handles integer, real or alphanumeric data
- Compatible with database systems

Data Transformations

- **RECODE** - Categorize variables
- **COMPUTE** new variables with algebraic equations and functions
- **IF** - Conditional **COMPUTE** statement
- **SELECT IF** - Select cases for processing

+ - * /
SQRT SIN LN and more
EQ NE GT GE LT LE
AND OR NOT

Descriptive Statistics

TPRICE		PRICE PER 100 TONELS			
MEAN	0.659	STD ERR	0.049	STD DEV	0.269
VARIANCE	0.072	KURTOSIS	6.793	SKEWNESS	2.246
RANGE	1.446	MINIMUM	0.314	MAXIMUM	1.760
VALID CASES	30	MISSING CASES	0		

Descriptive Statistics By Category

----- BREAKDOWN -----

CRITERION VARIABLE BROKEN DOWN BY	SALES CSIZE FACE	NUMBER OF SALES CLOWN SIZE CLOWN FACE			
VARIABLE	CODE VALUE LABEL	MEAN	STD DEV	N	
ENTIRE POPULATION		42.431	7.815	144	
CSIZE FACE	L LARGE	40.875	9.482	48	
	F FROWN	33.458	6.737	24	
	S SHILE	48.292	4.850	24	
CSIZE FACE	M MEDIUM	42.042	6.811	48	
	F FROWN	41.667	5.001	24	
	S SHILE	42.417	4.690	24	
CSIZE FACE	S SMALL	44.375	8.141	48	
	F FROWN	49.083	6.827	24	
	S SHILE	39.667	6.525	24	
TOTAL CASES = 144		MISSING CASES = 0			
6 CELLS USED OF 494					

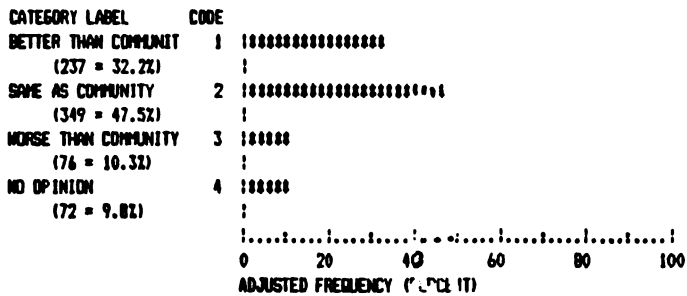
Counts and Percentages

V37 QUALITY OF MED CARE

CATEGORY LABEL	CODE	ABSOLUTE	RELATIVE	ADJUSTED	CUM
		FREQ	FREQ (PCT)	FREQ (PCT)	FREQ (PCT)
BETTER THAN COMMUNIT	1	237	30.0	32.3	32.3
SAME AS COMMUNITY	2	349	45.0	47.5	79.8
WORSE THAN COMMUNITY	3	76	10.0	10.4	90.2
NO OPINION	4	72	9.5	9.8	100.0
	0	46	5.5	MISSING	
TOTAL		780	100.0	100.0	

VALID CASES 734 MISSING CASES 46

V37 QUALITY OF MED CARE





Crosstabulation Tables

 PLAYACT MAJOR PLAY ACTIVITY BY WX WEATHER

PLAYACT	COUNT ROW PCT COL PCT TOT PCT	WX			ROW TOTAL
		CLEAR & WARM	COLD	RAINY	
		1	2	3	
TELEVISION	1	4 44.4 29.6 16.7	3 33.3 42.9 12.5	2 22.2 66.7 8.3	9 37.5
INSIDE TOYS	2	2 66.7 14.3 8.3	1 33.3 14.3 4.2	0 0.0 0.0 0.0	3 12.5
OUTSIDE TOYS	3	3 75.0 21.4 12.5	1 25.0 14.3 4.2	0 0.0 0.0 0.0	4 16.7
OUTSIDE PLAYMAT	4	1 33.3 7.1 4.2	1 33.3 14.3 4.2	1 33.3 33.3 4.2	3 12.5
INSIDE ADULTS	5	3 100.0 21.4 12.5	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 12.5
OUTSIDE ADULT	6	1 50.0 7.1 4.2	1 50.0 14.3 4.2	0 0.0 0.0 0.0	2 8.3
COLUMN TOTAL		14 58.3	7 29.2	3 12.5	24 100.0

CHI SQUARE = 6.2698 WITH 10 DEGREES OF FREEDOM.
 NUMBER OF MISSING OBSERVATIONS = 1

Analysis of Variance

----- A N O V A -----

SALES BY FACE CSIZE NUMBER OF SALES
CLOWN FACE CLOWN SIZE

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL EFFECTS	5	4816.056	803.211	23.497
MAIN EFFECTS				
FACE	1	152.111	152.111	4.450
CSIZE	2	304.889	152.444	4.440
2-WAY INTERACTIONS				
FACE.CSIZE	2	3559.056	1779.528	52.059
RESIDUAL	138	4717.250	34.183	
TOTAL	143	8733.306	61.072	

OVERALL MEAN = 42.431
THERE WERE 144 VALID CASES AND 0 MISSING CASES.

Pearson Correlation

CORR COEF
VALID N
T-STATISTIC

	QUALITY	MS	AC
COST	0.7869	0.6737	0.6681
	30	30	30
	6.748	4.823	4.751
TPRICE	0.7965	0.6660	0.7486
	30	30	30
	6.970	4.725	5.975

Multiple Regression

DEPENDENT VARIABLE HEALTHCOST BILLIONS OF DOLLARS
MEAN RESPONSE 109.529 STD. DEV. 64.9472

VARIABLES ENTERED ON STEP 1
CPI CONSUMER PRICE INDEX

0.9977 MULTIPLE R
0.9954 R SQUARE
0.9950 ADJUSTED R SQUARE
4.5728 STANDARD ERROR

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	1	67176.583	67176.583	3212.629
RESIDUAL	15	313.652	20.910	

VARIABLES IN THE EQUATION :

VARIABLE	B	STD ERROR B	F	BETA
CPI	1.3813	0.0244	3212.6289	0.9977
(CONSTANT)	-86.4478			

VARIABLES NOT IN THE EQUATION :

VARIABLE	PARTIAL	TOLERANCE	F
ENERGY	0.8654	0.0000	41.7685
GRADS	0.7361	0.0000	16.5611
YEARS	0.5357	0.0000	5.6342



FECHA DE DEVOLUCION

1 JUN 1988



