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FARM MANAGEMENT INFORMATION SYSTEM: THE STRUCTURE AND METHODOLOGY OF AN INTERACTIVE COMPUTER INFORMATION BASE

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ABSTRACT:

The paper describes the software and methodology used to create a user friendly Farm Management Information System available in the form of a computer information base as well as a field manual.

The computer information base may contain textual data (fact sheets), compiled spreadsheets or commercially available farm management software. The software system described utilises commonly available computer skills, may be maintained by non-programers and updated and expanded using files created using popular and commonly available software.

The information base allows:-

a) Design of a customised list of contents for the database.
b) Text files and graphs to be displayed to screen.
c) Compiled spreadsheets to be included as part of an interactive system.
d) Text files, dedicated word processor files, spreadsheets to be produced as hard copy (to printer) or to disc for incorporation into end user reports.

The information base is robust, can be distributed as a "runtime" version (without the need for end users to own brand-name software packages) and the compiling of any new or expanded systems is fully automated.

The presentation includes a demonstration of the software.

KEY WORDS:
COMPUTER
INFORMATION SYSTEMS
DATABASE
FARM MANAGEMENT

CONTENTS

1 INTRODUCTION 1

2 METHODOLOGY 1

3 THE PROGRAM 2

4 BUILDING AN APPLICATION 4

5 MACRO DEFINITIONS 5

6 FARM MANAGEMENT INFORMATION SYSTEM (PAPUA NEW GUINEA) 6

1 INTRODUCTION

The farm management unit of the Department of Agriculture and Livestock was formed as a small unit within the Policy, Programming and Budgeting Division in November 1990 as part of a one year technical assistance funded by the Asian Development Bank. As part of this technical assistance (ADB TA 1240 PNG) one component of the project was the compilation of a farm budgeting manual and a computer based information system. This information base contains primarily information collected for the farm budgeting manual.

In the design of the software the consultants were aware that there was a need to construct a system which utilised commonly available computer skills, could be maintained by non-programmers such that files within the system may be readily amended and updated or additional information incorporated, and which made use of commonly available software. In addition, the information base had to be adaptable to different applications and have the capability of including text files, spreadsheets, and other commercially available software.

2 METHODOLOGY

The software was developed as a Lotus spreadsheet containing embedded macros (program routines) which drive the system. Interactive spreadsheet programmes developed using Lotus 1-2-3 may be compiled as standalone programmes, which are both robust and user-friendly, using BalerXe (Trademark: Baler Software Corporation) spreadsheet compiler.

Specific areas of the spreadsheet allow the designer of the information base to:

1 Design a customised list of contents for the database.

2 Define which files will be incorporated into the information base (text files or compiled and interactive spreadsheets). Any number of files may be included in the information base.

3 Incorporate graphs, for display to screen within the text files, up to nine graphs may be included for display with any single text file. Consequently, any number of graphs may be included in the system provided the number associated with each text file does not exceed nine. A set of macros are described in the manual to incorporate into the system spreadsheet when customising the database.

These macros:-

- Display text with no graphs.
- Display text with one graph.
- Display text with n graphs (n = 1-9).
- Save text files to disc (user determines file name and disk drive on which to save the file).
- Allows branching to a baled spreadsheet.
- Saves a baled spreadsheet.
- Prints text files or spreadsheets to the printer as hard copy.

These macros need only be edited with respect to the appropriate filenames containing the data or baled spreadsheets and to the function keys dedicated to graph displays within a specific text file.

When the information base is completed or after systems maintenance (adding, deleting or amending information), the customised 1-2-3 spreadsheet containing the information base is compiled. The compiled program (the new information base) is user friendly and robust; after compiling, the program cannot be changed or inadvertently altered by general users.

The process for compiling the system is fully automated using embedded macros. The macros and the customising is explained fully in the manual which accompanies the software.

The software required to develop the system is Lotus 1-2-3 (v2.2 or higher) and BalerXe spreadsheet compiler. Since the compiling of the system is automated, a working knowledge of BalerXe software is not needed.

The only skills required for system maintenance is a knowledge of Lotus 1-2-3, including some knowledge of Lotus macro commands.

Since the program is compiled, a "runtime" version of the completed information base may be distributed to users who do not have copies of Lotus or BalerXe and without any copyright infringement.

3 THE PROGRAM

The customised system is developed by the user by editing a pre-formatted Lotus spreadsheet containing the embedded system macros and the macro which automates the process of baling using the spreadsheet compiler, BalerXe.

The layout of the pre-formatted spreadsheet is shown in Figure 1. The component sections of the spreadsheet are discussed below:-

Figure 1

The layout of FS.WK1, the systems spreadsheet, is:

```
     A...D   E   F   G   H   I..P   Q   R  S  T  U  V  W...Y  Z AA..AC
   +-------------------------------------------------------------------
1  |          | DRILLDOWN | GRAPH    | TEXT | PER -  | WORKING | FILE
2  |Main menu    TABLE     DATA      AREA   MANENT    CELLS    SAVING
3  |selections                                MACROS            SCREEN
4  |to be     |           |          |      |        |         |
5  |specified | Cols F &  | Enter    |
6  |for the   | G to be   | graph    |          DO NOT ALTER
7  |system.   | completed | data     |          CELLS TO THE
8  |          | for the   | in this  |          RIGHT OF P.
9  |          | info.base | section. |                         |
   |          |           |          |      |        |         |
   |          |           |          |      |        |         |
```

Only columns A to P are altered. The protected/unprotected status of any cells should be left unchanged.

Main Menu: This is the series of screens which contains a list of the contents of the information base which is customised to the user's requirements.

Drill Down Table: This is where the macro instructions are inserted together with the cell references to which these macros apply. The cell references refer to the options included in the main menu created by the user.

Graph Data: In this section of the spreadsheet all the data must be entered from which graphs are created in the various text files incorporated into the information base. All graph data and the associated working macros must be entered into the master spreadsheet template regardless of which fact sheet or text file to which they apply. As each text file is selected the macro determines which function keys are to be used to display the graphs associated with this file.

Text Area: This is the area of the spreadsheet into which the text files or spreadsheet files are incorporated when selected from the main menu options. This is the section of the spreadsheet the user sees once the particular option is selected. The maximum number of lines per text file is 500 and the maximum characters per line in text files is 72 characters. If the text files exceed 500 lines then they may still be incorporated into the information base by splitting them into several sub-files which are called independently in the main menu. At the top of the display the user is shown the percentage of the text file which has been viewed as they page down the particular text file which has been selected from the information base.

Permanent Macros: This section of the spreadsheet is not altered by the user since it contains the permanent embedded macros which drive the system and also the macros which automate "customising" using the BalerXe spreadsheet compiler.

Working Cells: This part of the spreadsheet simply contains cell range names which are used by the working macros, the value of these working cells changes depending upon which macros are operative, this is dependent upon the selection of options in the main menu.

File Saving Screen: This is the screen the user sees when they are given the opportunity to save a particular file to disk. Users have the option of saving a file to the hard drive or an A: or B: floppy drive; the objective is that they can then take this file away for incorporation into their own reports.

The system consists of a number of files, however, the user is only required to edit one file (the Lotus spreadsheet file) to create and customise their own database. In addition, the user sets up the relevant DOS text files or compiled spreadsheet files which are called from the main menu which the user creates. The files supplied with the system are:

1 FSFRESH.WK1: This is the template spreadsheet which is customised to create the end user's application (Refer Figure 1).

2 FS.TSC: This is the title screen for the application.

3 FS.CMD: Saves command status settings for customized files

4 FS.OTH: Saves other status settings for customized files

5 RUN2.EXE: This is the customised run engine, used in lieu of Baler's RUN.EXE execute file, for this particular application

When the FS.WK1 application file has been "BALED" and "CUSTOMISED" using BALERXE (in this application this process is automated using a macro command) two new files are created which replace the FS.WK1 file and which then form customised application files which are invoked using the RUN2.EXE program followed by the application name.

eg, type RUN2 FS <RTN> to run the Farm Management Information System

These files are FS.OVR and FS.WKB files which contain the formulae (.OVR file) the data and labels (.WKB files) which were specified in the uncompiled FS.WK1 file.

The original FS.WK1 file is then only required when the compiled system is to be edited and recompiled, it is not required to run the standalone system which will run independently of the original spreadsheet software (in this case LOTUS).

4 BUILDING AN APPLICATION

The process for building an application is as follows:-

In the file FS.WK1, using LOTUS 1-2-3:

1 Enter Menu options, with the first option that could be selected in cell B2. The total menu must be in columns A through to D inclusive (refer Figure 2).

2 Define the range with name MENU (this name must be used). This range must include all the menu options, and start at cell A1. The last row of the range must contain the final option "Quit".

The following example of a main menu is used:

Figure 2

	A	B	C	D
1				
2	1. Market Prices	Display	Save	
3				
4	2. Cash crops			
5	2.1 Copra	Display	Save	
6	2.2 Cocoa	Display	Save	
7				
8	3. Livestock	Display	Save	
9				
10		Quit		

3 Create the DrillDown Table. This table must go in the two columns F and G. The first column is a list of cell addresses. Each cell address is an option in the main menu entered above. The second column is a list of macros, one for each selection in the main menu; these determine which sub-routine or option of the system is called.

for example:-

3.1 Enter the cell address for each menu option in column F, starting at row 3. The address is entered as a label.
3.2 Enter a macro (see below) for the cell address in column G.

	F	G
1	DRILLDOWN TABLE	
2	Cell Label	Macro Instructions
3	B2	Macro for B2 - display text file with no graphs
4	C2	Macro for C2 - saving a text file
5	B5	Macro for B5 - display text file with one graph
6	C5	Macro for C5 - saving a text file
7	B6	Macro for B6 - display text file with n graphs
8	C6	Macro for C6 - saving a text file
9	B8	Macro for B8 - branch to another baled spreadsheet
10	C8	Macro for C8 - saving another baled spreadsheet
11	B10	'/QY
12		

NB: In G7 "n" is a number 9 or less.

3.3 Define the range with name DRILLTABLE (this name must be used). This range must include the rows in columns F and G that contain the information for each Menu option

5 MACRO DEFINITIONS

Once an application macro is written (for say loading a text file with graphs which may be displayed to screen by pressing a predefined function key - F key), it is a simple matter to copy this macro to another cell in column G which addresses a similar menu option (identified by the cell label in Column F). File names called by the macros and to redefine the graphs assigned to each function key are then edited such that the correct file and graphs are called for this new menu item.

The following macros are created by the designer of the information base; these are fully explained, with examples, in the User's Manual which accompanies the software.

1 Macro for displaying text with no graphs.

2 Macro for displaying text files.

3 Macro for displaying text files with n graphs.

4 Macro to branch to another baled spreadsheet.

5 Macro for saving a text file or a Baled Spreadsheet.

6 Create graphs and graph macros.

Enter graph data in the "Graph Data" section of the worksheet. The columns put aside for this section are I through to P.

Once the data for the graph has been entered create the graph in the usual manner using the Lotus /Graph command.

The following additional procedures are required to complete the process:-

7 Move to the HOME position and save the spreadsheet as FS.WK1.

8 Quit out of the spreadsheet.

9 Bale the FS.WK1 spreadsheet using BalerXe spreadsheet compiler.

10 Customiz FS: (Make sure the files FS.TSC, FS.CMD and FS.OTH are in the current directory), again using balerXe spreadsheet compiler.

Once loaded press Alt-F and the already-defined macro "F" will automatically carry out the required steps to customiz the baled worksheet.

11 The spreadsheet is now ready to run. The run engine supplied, RUN2.EXE, should be used in lieu of the one supplied with BalerXe.

6 FARM MANAGEMENT INFORMATION SYSTEM (PAPUA NEW GUINEA)

The Farm Budgeting Manual and the computer information base contain sections on:-

- Farm Revenue
- Farm Expenditure
- Model Farm and Enterprise Budgets

The format is similar to that used in the Lincoln University Financial Budgeting Manual.

The contents list for the Farm Budgeting Manual and the computer information base is attached in Appendix 1.

A user manual is available which provides instruction on the incorporation of text files and spreadsheets into the FMIS software and on setting up the contents index for the database.

Farm management survey data, collected by the Farm Management Unit, provides information for the Farm Budgeting Manual and forms part of the Farm Management Unit's computer information base.

The computer information base may contain textual data (fact sheets, compiled spreadsheets, or commercially available farm management software). The system utilises commonly available computer skills, may be maintained by non-programmers and updated and expanded using files created using popular and commonly available software. The spreadsheet compiler used in developing the software application can handle other spreadsheet software as well as files created using Lotus 123; however, the macro commands used in developing the software must be consistent with the Lotus macro commands since BalerXe was originally developed for compiling Lotus spreadsheets.
The information base allows:-

1 Design of a customised list of contents for the database.

2 Text files and graphs to be displayed on screen.

3 Compiled spreadsheets to be included as part of an interactive system.

4 Text files, dedicated word processor files, spreadsheets to be produced as hard copy (to printer) or to disk for incorporation into end user reports.

Examples of compiled spreadsheets or commercial software, might be such programs as gross margins, whole farm budgets and cash flows for the major crop and livestock enterprises in Papua New Guinea.

The information base is robust, can be distributed as a runtime version (without the need for end users to own brand name software packages) and the compiling of any new or expanded system is fully automated.

The software may be used to construct other information bases which may be advantageously stored and accessed using a computer. Providing such data may be stored as DOS text files or as spreadsheets, the system may find other applications other than within the Department of Agriculture and Livestock.

The Farm Management Information System was installed in the Department of Agriculture and Livestock, in February 1992 shortly after the completion of the ADB Technical Assistance.

Reference: *"Farm Management Information System: A Manual for the Systems Maintenance of the Computer Information Base". ANZDEC Ltd in Association with Dr A F Stent and Ms L M Stent, University of Otago, Dunedin.*

December 1991

APPENDIX I

======= D.A.L. FARM MANAGEMENT INFORMATION SYSTEM =======

Introduction
- Section A
- Section B

SECTION 1 - FARM REVENUE

1 CASH CROPS
1.1 Export Earnings

1.2 Coffee
1.2.1 Production
1.2.2 Largeholder versus Smallholder Production
1.2.3 Exports
1.2.4 Prices

1.3 Cocoa
1.3.1 Production
1.3.2 Largeholder versus Smallholder Production
1.3.3 Exports
1.3.4 Prices

1.4 Copra
1.4.1 Production
1.4.2 Exports
1.4.3 Prices

1.5 Oil Palm
1.5.1 Production
1.5.2 Exports
1.5.3 Prices

1.6 Rubber
1.6.1 Production
1.6.2 Smallholder Rubber Production
1.6.3 Exports
1.6.4 Prices

1.7 Minor Crops
1.7.1 Cardamom
1.7.2 Chillies
1.7.3 Pyrethrum
1.7.4 Tea
1.7.5 Cardamom and Chillie - World Price Trend

2 FOODCROPS
2.1 Subsistence or Traditional Foodcrop Production
2.1.1 Import Substitution of Vegetables

2.2 Prices of vegetables, fruits and rootcrops

2.3 Commercial Food Crop Production
2.3.1 Rice
2.3.2 Maize and Sorghum

3 LIVESTOCK
3.1 Subsistence livestock Production
3.1.1 Pig sales at village market
3.1.2 Chicken sales at village market
3.1.3 Goat sales at village market
3.1.4 Sheep and Wool sales at village market

3.2 Commercial Livestock Production
3.2.1 Cattle
3.2.2 Prices of beef
3.2.3 Beef price - World Trend
3.2.4 Prices of pigs
3.2.5 Chicken

SECTION 2 - FARM EXPENDITURE

1 LABOUR WAGES
1.1 Minimum rates of pay for centres designated
1.1.1 Level one centre
1.1.2 Level two centre
1.2 Vehicle use

2 ELECTRICITY
2.1 Electricity commission charges
2.2 Connection, reconnection, transfer of supply charges
2.3 Temporary supply charges for connection
2.4 Tariff rates

3 FERTILISER
3.1 Soil, water, plant and feedstuff testing
3.1.1 National Analysis Laboratory
3.1.2 National Agricultural Chemistry Laboratory

4 FREIGHT AND CARTAGE
4.1 Air freight rates
4.1.1 1991 Talair air freight rates
4.1.2 Air Niugini Domestic air cargo rates
4.2 Land freight rates
4.2.1 Rates for different sizes of containers
4.3 Seafreight rates
4.3.1 Domestic seafreight list

5 SEEDS AND PLANTS
5.1.1 Cash crop seedlings
5.1.2 Cocoa seeds
5.1.3 Oil Palm seeds
5.1.4 Coconut seeds

5.1.5	Rubber seeds
5.1.6	Cardamom and Pyrethrum seeds
5.1.7	Coffee seedlings
5.2	Vegetable seeds
6	AGRICULTURAL CHEMICALS
7	VEHICLE EXPENSES
7.1	Maximum prices for petrol, distillate and kerosine for government purchase from oil companies and their agents
7.2	Registration\licensing\road charges
7.3	Tractor
7.3.1	Dunlop tractor tyres
7.3.2	Dunlop tractor tubes
8	PROFESSIONAL FEES
8.1	Real estates
8.1.1	Sale commissions
8.1.2	Valuation fees
8.1.3	Auction fees
8.1.4	Land transfer fees
8.2	Legal fees
8.2.1	J.F Aisa and Associates lawyers
8.2.2	Warner Shand Lawyers
8.3	Consultancy charges
9	ADMINISTRATION EXPENSES
9.1	Telephone and toll charges
9.1.1	Postage
9.1.2	Domestic postal service
10	FENCING COST
10.1	Fencing material
10.2	A.R.C Titan material
11	FARM MACHINERY & EQUIPMENT COST
11.1	Tractors
11.1.1	Attachments and implements
11.2	Machinery
11.3	Cocoa tools
11.4	Hand tools
12	FINANCIAL CHARGES
12.1	Loan facilities available to the Agriculture sector and farmers
12.2	Loan repayment schedule on fully drawn loans, credit guarantee loans and personal loans
12.3	Banks policy on security
12.4	Bank charges and fees
13	WATER SUPPLY, IRRIGATION ETC.
13.1	Water supply charges
13.2	Water tanks
13.2.1	Southern cross tanks

13.3 Pipes
13.3.1 Pressure pipes
13.4 Pumps
13.4.1 Onga pumps

14 LIVESTOCK SLAUGHTER FEES
14.1 Sources of stock slaughtered at the Lae Central Abattoir

15 STOCKFEED

16 ANIMAL HEALTH

17 CONSUMER PRICE INDEX

SECTION 3 - CASHCROPS, FOODCROPS AND LIVESTOCK BUDGETS

1 CASHCROPS
1.1 Cocoa & copra plantation model
1.2 Managed village sole cocoa model
1.3 Cocoa plantation costs of production (C.O.P.) 1989, 1990
1.4 1991 Coffee plantation C.O.P.
1.5 Smallholder coffee (Survey Data)
1.6 Smallholder peanut , < 0.5 ha
1.7 Medium scale commercial peanuts
1.8 Large scale commercial peanuts
1.9 Smallholder maize (tractor hire)
1.10 Smallholder maize (tractor owner)
1.11 Maize C.O.P. (largeholder)
1.12 Smallholder bananas - (dryland)
1.13 Smallholder oilpalm development budget & cash flow - Oro province
1.14 Smallholder cocoa (Survey Data)
1.15 Smallholder rubber (No factory)
1.16 Smallholder rubber budget & cash flow (factory & latex sales)

2 FOODCROPS
2.1 Smallholder lettuce gross margin
2.2 Smallholder tomato gross margin
2.3 Smallholder cauliflower G.M.
2.4 Smallholder broccoli G.M.
2.5 Smallholder English cabbage G.M.
2.6 Smallholder carrot gross margin
2.7 Smallholder potato gross margin

3 LIVESTOCK
3.1 Smallscale cattle ranch < 500 ha
3.2 Largeholder cattle:annual budget
3.3 Smallholder cattle budget
3.4 Smallholder goat gross margin
3.5 Smallholder sheep G.M.-Highlands
3.6 Smallholder sheep G.M.-Lowlands
3.7 Semi-commercial sheep -Highlands
3.8 G.M. for 600 bird layer unit
3.9 Broilers, 200 birds, Lae

3.10 Broilers, 200 birds, Goroka
3.11 Broilers, 100 birds, Rabaul
3.12 Commercial 10 sow piggery

4 OTHER
4.1 Tractor operating and ownership

CONVERSION/WEIGHTS & MEASURES TABLES

DATA USED FOR GRAPHS IN FMIS SYSTEM

SECTION 4 - EXAMPLE SPREADSHEETS (Section to be expanded at later date)

4.1 Coffee plantation C.O.P.
4.2 Cocoa & copra plantation model
4.3 Smallholder peanuts; < 0.5 ha