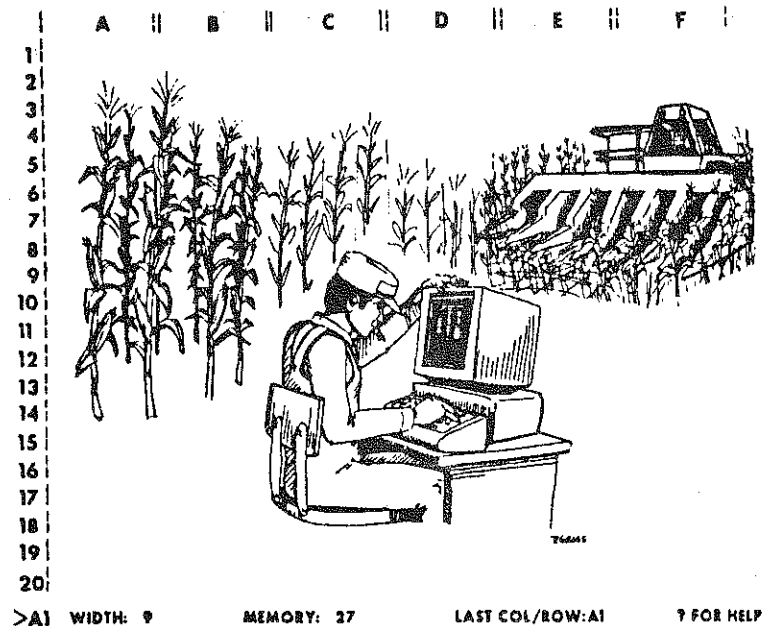


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CROP MANAGEMENT DECISION ANALYSIS

A Spreadsheet Template and Forward Planning Concepts



by

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FOREWORD

This publication describes one of four related sets of Lotus 1-2-3 templates. They were developed primarily for calculating enterprise budgets and costs and returns for a mix of enterprises. Changes can be made in the size of an enterprise or any of its cost and return items, and capital items can be bought or sold. Impacts on total farm costs and returns can be observed. The sets are:

CROP MANAGEMENT DECISION ANALYSIS - this is a single template that calculates annual operating costs and returns for up to ten crop enterprises. It does not do any calculations of machinery operating costs. It calculates machinery ownership costs for up to five machines that are bought or sold as part of the change being analyzed. An earlier version of this template was used in teaching Ag. Econ. 302, Farm Business Management, in the spring of 1986. The user's manual is A.E. Extension 86-37.

CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS - this is a three template set. It calculates annual hours of use and operating and ownership costs for tractors, implements and trucks, and transfers the summary data to up to five enterprise budgets. The crop cost and return calculations are similar to those in CROP MANAGEMENT DECISION ANALYSIS. These templates have been used mainly by researchers at Cornell to calculate crop costs and returns. The user's manual is A.E. Extension 86-39.

CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS (EXPANDED) - this is similar to CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS, but has room for up to ten crops. Growing and harvesting costs are not separated as they are in the other template sets. A separate user's manual was not written for the expanded version.

CROP AND LIVESTOCK DECISION ANALYSIS - this is a single template that calculates annual operating costs and returns for up to 10 crop enterprises and three livestock enterprises. It does not do any machinery annual operating cost calculations, but does calculate ownership costs. It allows you to balance home-grown feed produced and fed. The user's manual is A.E. Extension 86-38.

DISCLAIMER

Although these templates have been tested and the documentation reviewed, it is not possible to completely eliminate the possibility that errors still exist. Nor is it possible for the author to prevent you, the user, from modifying the formulas or text inadvertently or on purpose in such a way as to calculate incorrect results. Even if the results are calculated correctly, the assumptions of the analysis may limit their applicability to any particular decision. THEREFORE, the templates and documentation are provided on an "as is" basis. No warranty or representation, either express or implied, is made with respect to these templates, their quality, performance, merchantability, or fitness for a particular purpose. You, the user, assume the entire risk as to their quality and performance.

ACKNOWLEDGEMENT

The author wishes to thank Wayne A. Knoblauch for helpful suggestions on earlier versions of the CROPMN10 template and for tolerating its "bugs" while teaching Ag. Econ 302.

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CROP MANAGEMENT DECISION ANALYSIS
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Forward Planning Concepts

INTRODUCTION

The changing economic climate of the mid-1980's is leading many farm operators to analyze adjustment opportunities more carefully than in the past. Many of these adjustments on dairy and cash crop farms involve changes in the cropping program. Some examples are:

1. Renting or purchasing additional parcels of cropland.
2. Changing acres of forages and grain crops on different fields and soil types.
3. Replacing machinery and equipment.
4. "Fine-tuning" rates and types of fertilizer, chemicals and other annual crop inputs.
5. Participating in government acreage diversion programs.

Enterprise budgets and the partial budgeting technique have been essential tools for analyzing individual changes with fairly straightforward impacts on the total business. They are also useful for simply increasing awareness of the costs and returns involved in producing crops. For more major changes where it is realized that interrelationships will cause impacts on several aspects of the business operation, total business budgeting should be used instead.

Budgeting with a pencil and paper or a hand calculator can be time-consuming and tedious. Microcomputers and electronic spreadsheet software can reduce greatly the time required for calculating budgets, especially when several alternatives are being analyzed.

Description

The CROPMN10 (CROP MANAGEMENT DECISION ANALYSIS) template calculates annual operating costs and returns per acre for each of up to five crop enterprises and farm totals. It does not do any calculations of machinery operating costs. These must be obtained from the farm operator's past records, if available, or from an off-farm source such as a set of published enterprise budgets calculated for typical situations. It calculates machinery ownership costs for up to five machines that are bought or sold as part of the change being analyzed. This is consistent with the partial budgeting technique, where only those costs and returns that change with the proposed adjustment are examined. More than five machines can be included by grouping them based on years owned and salvage value. A second template, CROPMND, is the same as CROPMN10 but with sample data stored for a corn grain budget with a combine purchase.

An electronic spreadsheet is a popular type of microcomputer software for business and agricultural applications. The name comes from similarity to a paper spreadsheet on which calculating tasks are set up as tables of columns and rows of figures. These rows and columns are titled, cross referenced and manipulated mathematically. An electronic spreadsheet arranges the computer's memory as an "electronic sheet". The computer's screen becomes a "window" which looks at a part of the spreadsheet. A template is a set of spreadsheet instructions to perform a specific task. The instructions are made up of labels, values and formulas.

What You Need to Use the Template

To use a diskette copy of the templates discussed in this paper, you will need

1. A Lotus 1-2-3 electronic spreadsheet program diskette and user manual.
2. An IBM-compatible microcomputer with at least 192 K of internal memory, if using version 1A of Lotus 1-2-3.
3. A 132-column printer for producing paper copies.
4. At least two blank diskettes for storing completed budgets (one for the original and one as a backup).

Obtaining a Diskette Copy of the Templates

The templates can be obtained from your county Extension agent or William F. Lazarus, Department of Agricultural Economics, Cornell University, Ithaca, N.Y., 14853, for details on obtaining a diskette copy. A nominal handling fee may be charged to cover diskette duplicating and mailing costs.

A Word of Caution

Electronic spreadsheets, like other computerized decision aids, perform calculations. They do not eliminate the need for the user to check the results carefully to make sure that the data has been entered correctly and the operations performed in the proper order. Use common sense, print out the results, and spot-check with a calculator.

Care is in order especially when the user modifies the formulas to suit his or her problem. Most of the formulas have been protected from accidental changes, but this protection can be overridden. The user bears responsibility for seeing that any changes are done properly.

TEMPLATE USERS MANUAL

Making Backup Copies

Before starting your first CROPMN10 session you should protect your CROPMN10 program diskette by making a backup copy of it. Making this backup is important for two reasons. One, your original distribution diskette will give you a write protect error if you try to save your work on it. And two, if your diskette develops a fatal error you will always have the original diskette. The original CROPMN10 program diskette should be put in a safe location and never used for day-to-day work.

Making a backup copy on a computer with two floppy disk drives is easy when following these simple step-by-step instructions:

- 1- Put your 1-2-3 Utility Diskette in drive A (left side) and turn the power on. If the power is already on press <CTRL> <ALT> keys simultaneously.
- 2- Label a blank diskette as "CROPMN10 - Working Copy" and put this diskette in drive B (right side). For single drive users, 1-2-3 will prompt you to appropriately swap disks as needed.
- 3- Use the arrow keys to select the Disk Manager option and press <ENTER>.
- 4- Use the arrow keys again to select the Disk Copy option and press <ENTER>.
- 5- When prompted, remove the Utility Disk from drive A, insert your original CROPMN10 program diskette and press the <ENTER> key.
- 6- When the copy is complete remove the original CROPMN10 disk from drive A and put it in a safe location.
- 7- Use your working copy of CROPMN10 as the daily working copy.

Starting Up CROPMN10

Load the CROPMND or CROPMN10 template by starting the Lotus 1-2-3 program and inserting the diskette. Use the

/File Directory

command to select the drive containing the template, and

/File Retrieve CROPMND

(The file name is capitalized here for emphasis, but lower case letters work just as well.) You should see Figure 1 appear on your screen.

FIGURE 1. Introductory Screen (AC56..AI75)

```

AC56: 'V1.1
ACRES/INPUTS  CROPS  MACHINE  LAND  PRODUCT  FARM  UTILITY  QUIT
Enter Acres of Each Crop & Commonly Used Inputs
      AC      AD      AE      AF      AG      AH      AI
56  V1.1
57
58      Crop Management Decision Analysis
59      -----
60      Purpose - budgetting impacts of changes in crop acres,
61      yields, prices and input rates per acre, and machinery
62      ownership costs.
63      Use - Enter acres of each crop in ACRES.
64      Menu directs you to budget worksheets for up to 10 CROPS.
65      Farm totals are then shown (select FARM from menu). Land
66      costs including rent and taxes are entered here as well.
67      Enter budgets for base situation, then change.
68      Then enter prices and cost factors for up to 5 MACHINES
69      to be purchased or sold to handle changed crop acres.
70
71      Developed by William F. Lazarus
72      Programmed by William F. Lazarus and Paul L. Eddie
73      Dept. of Ag. Econ., Cornell University
74
75      FOR COMMAND BAR MENU PRESS Alt M

```

The template is menu driven through a number of command bar menus that appear at the top of the screen. They are based on Lotus 1-2-3 macros. Macros take effect when you hold down the [Alt] key located in the lower left area of the keyboard, and press the proper letter key. To get the first menu, hold down [Alt] and press M, abbreviated as

Alt M

At this time, press Alt M and you should see the menu appear as in Figure 1. The screen should show columns AC through AI and rows 56 through 75, as the range (AC56..AI75) in Figure 1's title shows.

The template is divided into seven areas (Figure 2). The first six can be reached by making selections from the menu. The first, ACRES, is where an analysis name and location and a description of each crop and acres grown are entered. The second, INPUTS, is a place to enter commonly used operating input names, measurement units and prices. You can save some data entry time by entering an input like nitrogen fertilizer once here and then copying it to a number of enterprise budgets using a macro. CROPS, is where the crop yields and annual costs are entered. MACHINE, the third, contains space for machinery purchase prices and ownership cost factors. PRODUCT gives a summary of crop quantities produced. FARM shows total crop value, expenses and net returns for all of the crops included in the analysis. The last area of the template contains the macros used to create the menus and the introductory screen.

Some data entry is done by using 1-2-3's "range input" facility. This facility allows you to move the cursor only to the high intensity cells, or contrasting color cells for color monitors, to enter data. High intensity cells, as the name implies, appear brighter than low or normal intensity cells. The difference in intensities for monochrome monitors and color for color monitors is easily distinguishable on the monitor display.

Figure 2. Layout of CROPMN10 Template

CROPS		ACRE	PRODUCT	MACHINE
Introduction & Macros	INPUTS		FARM	

You can leave the "range input" mode by pressing <ENTER> an extra time. The cursors will move to the upper left of the data entry area. Now you can move the cursor anywhere, so that you can review the results. Pressing <ENTER> one more time returns you to the menu.

There are eight options in the menu. Select one by placing the cursor over the desired option and pressing the return key. As the cursor is placed over each option, a brief description of that selection is displayed on the line below. You can also make a selection from the menu by typing the first letter of the option instead of moving the cursor. A description of each option is shown below. Figure 3 shows the menus in the template.

Figure 3. Menus in CROPMAN Template

Main Menu	Sub-Menus
ACRES/INPUTS-----	--ACRES --INPUTS --NAMES --QUIT
CROPS-----	--1 --2 --3 --4 --5 --6 --CROP7-10-- --7 --8
MACHINE	
LAND	
PRODUCT-----	--CONTINUE --UNITS
FARM	
UTILITY-----	--SAVE --BASE --PRINT----- --1 --2 --3 --4 --5 --ALL --CROP6-10-- --6 --7 --8 --9 --10 --ALL --CROP1-5 --QUIT --QUIT
QUIT	

	BT	BU	BV	BW	BX	BY	BZ	CA	CB
1	NAME:	Sam Farmer							
2	LOCATION:	Farmtown, NY							
3	ACRES OF EACH CROP								
4	=====								
5	Crop No.	Crop Description	Acres	Total Quantity Produced					
6	-----	-----	-----	Prod. 1	Prod. 2				
7	1	Corn Grain	200	24000 bu.					0
8	2		0	0					0
9	3		0	0					0
10	4		0	0					0
11	5		0	0					0
12	6		0	0					0
13	7		0	0					0
14	8		0	0					0
15	9		0	0					0
16	10		0	0					0
17	TOTAL ACRES		200						
18									
19									
20									

Figure 5. Crop Input Descriptions and Prices

BL64: U 'potassium

READY

BL	BM	BN	BO	BP	BQ	BR
58	CROP INPUT DESCRIPTIONS AND PRICES					
59	=====					
60	INPUT	UNITS	RATE/A	PRICE/UNIT		
61	corn seed	bag	0	60.00		
62	nitrogen	lbs.	0	0.24		
63	phosphorus	lbs.	0	0.22		
64	potassium	lbs.	0	0.14		
65			0	0.00		
66			0	0.00		
67			0	0.00		
68			0	0.00		
69			0	0.00		
70			0	0.00		
71			0	0.00		
72			0	0.00		
73			0	0.00		
74			0	0.00		
75			0	0.00		
76			0	0.00		
77			0	0.00		

CROPS

The second option, CROPS, brings up a second menu listing the crop numbers, from which you can go to each crop enterprise budget as in Figure 6. Select 1. There will be a slight pause while the crop description is copied to the top of the budget. Item descriptions are entered in column A. Units of measurement, quantity per acre and price per unit are entered in C, D and E. Crop value or expense per acre for each item is calculated in column F. This column is protected from accidentally changing the formulas, as are the column and row headings.

FIGURE 6. Enterprise Budget (A1..G20)

A5: 'CROP VALUE

READY

	A	B	C	D	E	F	G
1					CROP 1		200
2					Corn Grain		TOTAL ACRES
3			=====				
4			UNITS	RATE/A	PRICE/UNIT	\$/ACRE	\$/CROP
5	CROP VALUE						
6	shelled corn	bu.		120	\$2.00	\$240.00	\$48,000.00
7						0.00	0.00
8	TOTAL VALUE					\$240.00	\$48,000.00
9							
10	ANNUAL OPERATING EXPENSES						
11	GROWING						
12	Seed						
13	corn seed	bag		0.3	60.00	\$18.00	\$3,600.00
14						0.00	0.00
15	Fertilizer						
16	nitrogen	lbs.		125	0.24	30.00	6,000.00
17	phosphorus	lbs.		40	0.22	8.80	1,760.00
18	potassium	lbs.		40	0.14	5.60	1,120.00
19	Lime	Ton		0.5	25.00	12.50	2,500.00
20	Chemicals						

CALC

Use the cursor keys or [PgDn] to scroll down to see the bottom half of the budget. Press Alt W to open a window at the bottom of the screen showing the list of common operating inputs you entered with the inputs option. To use one of these, first move the cursor to the left column of the budget, column A, for crop budget 1. Move down to the row where you want the input entered. Then press Alt C to select an input. The macro assigns a range name to this cell, then moves to the second window. Now scroll up or down to the input you want, and press <Enter>. The input description, units and price will be copied to the budget, leaving you to enter the quantity applied. Press the F9 key if you want to see the cost per acre.

MACHINE

The MACHINE option takes you to an area where machinery purchase or sale prices and ownership cost factors are entered for up to five machines (Figure 7). Normally, you would leave this area blank for a base analysis. Then to analyze the effects of a change, save the base analysis under your own file name. Then, under a new file name, enter information for machinery purchased or sold as part of the change you are analyzing, along with changes in acres and enterprise budget items. Enter price as a positive number for purchases and negative for sales. See BASE below for more details on making the comparison of this adjusted analysis to the base analysis.

FIGURE 7. Machines Purchased or Sold (AL57..AR76)

AN63: U 'combine

CMD READY

	AL	AM	AN	AO	AP	AQ	AR
57							
58	Enter the data for each machine starting in column AT						
59	and continuing towards the right over to column AX. Data						
60	for up to 5 machines can be entered if needed.						
61							
62	MACHINES BOUGHT, SOLD OR TRADED						
63	Machine type	combine	machine	machine	machine	machine	
64			name	name	name	name	
65	Purchase price	\$64,100	\$0	\$0	\$0	\$0	
66							
67	Years owned	7	0	0	0	0	
68	Salvage rate (%)	40%	0%	0%	0%	0%	
69	FOR ALL MACHINES:						
70	Interest rate (%)	12.00%					
71	Insurance rate(%)	0.50%					
72	Storage rate (%)	0.50%					
73							
74	TOTAL OWNERSHIP COSTS						
75	% OF PRICE	17.67%	0.00%	0.00%	0.00%	0.00%	
76	TOTAL COST/YR.	\$11,327	\$0	\$0	\$0	\$0	

PRODUCT

The PRODUCT option takes you to Figure 9, showing quantity produced for up to two crop products (wheat and straw, for example) for each crop. This can be useful for comparing with feed needs of a dairy herd.

When doing your own budget, when you select PRODUCT the first time, you will not see units of measurement in columns AP and AR. Selecting UNITS from the menu will call a macro which copies the units from the crop value part of the enterprise budget into columns AP and AR.

FIGURE 9. Crop Quantities Produced (BU3..CC22)

BU3:

CMD MENU

CONTINUE UNITS

Return to Main Menu

	BU	BV	BW	BX	BY	BZ	CA	CB	CC
3									
4									
5	Crop Description	Acres	Total Quantity Produced						
6	-----	-----	Prod. 1		Prod. 2				
7	Corn Grain	200	24000 bu.		0				
8		0	0		0				
9		0	0		0				
10		0	0		0				
11		0	0		0				
12		0	0		0				
13		0	0		0				
14		0	0		0				
15		0	0		0				
16		0	0		0				
17		200							
18									
19									
20									
21									
22									

FARM

This option shows you totals of crop value and each expense category for all of the crops entered, in column AM labelled "THIS ANALYSIS" (Figure 10). Use [PgDn] or the cursor keys to scroll down and see RETURN OVER SELECTED EXPENSES. See BASE below.

FIGURE 10. Total Crop Value and Expenses (CI1..CN20)

CI1: 'TOTAL ALL CROPS

CMD READY

	CI	CJ	CK	CL	CM	CN
1	TOTAL ALL CROPS		THIS ANALYSIS	BASE	CHANGE	
2	=====		=====	=====	=====	
3						
4	CROP VALUE		\$48,000	\$0	\$48,000	
5	-----		-----		-----	
6	GROWING EXPENSES					
7	Seed		\$3,600	\$0	\$3,600	
8	Fertilizer & Lime		11,380	0	11,380	
9	Spray & other		5,546	0	5,546	
10	Power & equipment		2,524	0	2,524	
11	Interest, operating		519	0	519	
12	Labor		2,600	0	2,600	
13	TOTAL GROWING		\$26,169	\$0	\$26,169	
14						
15	HARVEST, SELL EXPENSES					
16	Power & equipment		\$3,174	\$0	\$3,174	
17	Storage, drying & other		7,200	0	7,200	
18	Interest, operating		86	0	86	
19	Labor		1,000	0	1,000	
20	TOTAL HARVEST, SELL		\$11,460	\$0	\$11,460	

UTILITY

This option brings up a second menu. The first option, SAVE, allows you to save the completed budget under your own file name. The second option, BASE, erases column AN of the crop totals area and prompts you for the name of a file containing a base or first analysis that you wish to compare to this analysis. Then it loads the crop totals from that file into the BASE column and calculates the change in each item, displayed in the CHANGE column.

The third option, PRINT, prints the crop descriptions and acres, the crop totals, machinery cost calculations and total crop quantities. Then it calls a menu where you select crop enterprise budgets to be printed. Each enterprise budget can be printed individually. Or selecting ALL prints all five budgets. Figure 11 is a sample printout. The last option, QUIT, returns you to the main menu.

QUIT

The QUIT option in the main menu returns you to normal mode.

Figure 11. Sample Printout

Crop Management Decision Analysis

NAME: Sam Farmer
 LOCATION: Farmtown, NY

TOTAL ALL CROPS =====	THIS ANALYSIS =====	BASE =====	CHANGE =====
CROP VALUE	\$48,000	\$0	\$48,000

GROWING EXPENSES			
Seed	\$3,600	\$0	\$3,600
Fertilizer & Lime	11,380	0	11,380
Spray & other	5,546	0	5,546
Power & equipment	2,524	0	2,524
Interest, operating	519	0	519
Labor	2,600	0	2,600
TOTAL GROWING	\$26,169	\$0	\$26,169
HARVEST, SELL EXPENSES			
Power & equipment	\$3,174	\$0	\$3,174
Storage, drying & other	7,200	0	7,200
Interest, operating	86	0	86
Labor	1,000	0	1,000
TOTAL HARVEST, SELL.	\$11,460	\$0	\$11,460
TOTAL ANNUAL OPERATING EXPENSES	\$37,629	\$0	\$37,629
NET OVER ANNUAL OPERATING EXPENSES	\$10,371	\$0	\$10,371
OTHER EXPENSES			
Machine ownership	\$11,327	\$0	\$11,327
Land	2,500	0	2,500
Taxes	1,500	0	1,500
Fixed operator labor	0	0	0
Miscellaneous	0	0	0
TOTAL OTHER	\$15,327	\$0	\$15,327
TOTAL INCLUDED EXPENSES	\$52,957	\$0	\$52,957

RETURN OVER INCLUDED EXPENSES	(\$4,957)	\$0	(\$4,957)

Crop Management Decision Analysis

ACRES OF EACH CROP

=====

Crop No.	Crop Description	Acres	Total Quantity Produced	
			Prod. 1	Prod. 2
1	Corn Grain	200	24000 bu.	0
2		0	0	0
3		0	0	0
4		0	0	0
5		0	0	0
6		0	0	0
7		0	0	0
8		0	0	0
9		0	0	0
10		0	0	0
TOTAL ACRES		200		

Compared to Base Analysis

ACRES OF EACH CROP

=====

Crop No.	Crop Description	Acres
1		0
2		0
3		0
4		0
5		0
6		0
7		0
8		0
9		0
10		0
TOTAL ACRES		0

CHANGES IN LAND OR OTHER EXPENSES, OTHER THAN
ANNUAL OPERATING EXPENSES OR MACHINERY OWNERSHIP COSTS

=====

Item	Farm Total
Land	\$2,500
Taxes	1,500
Fixed operator labor	0
Miscellaneous	0

MACHINES BOUGHT, SOLD OR TRADED

Machine type	combine	machine name	machine name	machine name	machine name
Purchase price	\$64,100	\$0	\$0	\$0	\$0
Years owned	7	0	0	0	0
Salvage rate (%)	40%	0%	0%	0%	0%
FOR ALL MACHINES:					
Interest rate (%)	12.00%				
Insurance rate(%)	0.50%				
Storage rate (%)	0.50%				

TOTAL OWNERSHIP COSTS

% OF PRICE	17.67%	0.00%	0.00%	0.00%	0.00%
TOTAL COST/YR.	\$11,327	\$0	\$0	\$0	\$0

Crop Management Decision Analysis

		CROP 1		200	
		Corn Grain		TOTAL ACRES	
=====					
	UNITS	RATE/A	PRICE/UNIT	\$/ACRE	\$/CROP
CROP VALUE					
shelled corn	bu.	120	\$2.00	\$240.00	\$48,000.00
				0.00	0.00
TOTAL VALUE				\$240.00	\$48,000.00
ANNUAL OPERATING EXPENSES					
GROWING					
Seed					
corn seed	bag	0.3	60.00	\$18.00	\$3,600.00
				0.00	0.00
Fertilizer					
nitrogen	lbs.	125	0.24	30.00	6,000.00
phosphorus	lbs.	40	0.22	8.80	1,760.00
potassium	lbs.	40	0.14	5.60	1,120.00
Lime	Ton	0.5	25.00	12.50	2,500.00
Chemicals					
dual 8E	pt.	2	5.91	11.82	2,364.00
atrazine 4L	qt.	1	2.11	2.11	422.00
furadan 15G	lbs.	10	1.38	13.80	2,760.00
				0.00	0.00
				0.00	0.00
				0.00	0.00
				0.00	0.00
				0.00	0.00
Power,equipment					
Fuel,oil			6.16	6.16	1,232.00
Repair,main.			6.46	6.46	1,292.00
Other			0.00	0.00	0.00
Interest,operating		\$115.25	Rate/yr		
Months		6	10.00%	2.59	518.70
Labor	Hour	2.6	5.00	13.00	2,600.00
TOTAL GROWING				\$130.84	\$26,168.70
HARVESTING & SELLING					
Power,equipment					
Fuel,oil			\$5.14	\$5.14	\$1,028.00
Repair,main.			10.73	10.73	2,146.00
Storage,drying & other			36.00	36.00	7,200.00
Interest,operating		\$51.87	Rate/yr		
Months		1	10.00%	0.43	86.45
Labor	Hour	1.0	5.00	5.00	1,000.00
TOTAL HARVESTING & SELLING				\$52.30	\$10,460.45
TOTAL ANNUAL OPERATING EXPENSES				\$183.15	\$36,629.15
NET OVER ANNUAL				\$56.85	\$11,370.85
OPERATING EXPENSES					
BREAKEVEN PRICE/UNIT FOR PRIMARY PRODUCT				\$1.53	
TO COVER ANNUAL OPERATING EXPENSES					

Crop Management Decision Analysis

NAME: _____
 LOCATION: _____

ACRES OF EACH CROP

Crop No.	Crop Description	Acres
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____

MACHINES BOUGHT, SOLD OR TRADED

Machine type _____

Purchase price \$ _____ \$ _____ \$ _____ \$ _____ \$ _____

Years owned _____ % _____ % _____ % _____ % _____ %

Salvage rate (%) _____ % _____ % _____ % _____ %

FOR ALL MACHINES:

Interest rate (%) _____ %

Insurance rate (%) _____ %

Storage rate (%) _____ %

 CHANGES IN LAND OR OTHER EXPENSES, OTHER THAN
 ANNUAL OPERATING EXPENSES OR MACHINERY OWNERSHIP COSTS

Item	Farm Total
Land	_____
Taxes	_____
Fixed operator labor	_____
Miscellaneous	_____

Crop Management Decision Analysis

CROP 1

	UNITS	RATE/A	PRICE/UNIT
CROP VALUE			
TOTAL VALUE			
ANNUAL OPERATING EXPENSES			
GROWING			
Seed			
Fertilizer			
Lime	Ton		
Chemicals			
Power, equipment			
Fuel, oil			
Repair, main.			
Other			
Interest, operating		\$0.00	Rate/yr
Months			
Labor	Hour		
TOTAL GROWING			
HARVESTING & SELLING			
Power, equipment			
Fuel, oil			
Repair, main.			
Storage, drying & other			
Interest, operating		\$0.00	Rate/yr
Months			
Labor	Hour		
TOTAL HARVESTING & SELLING			
TOTAL ANNUAL OPERATING EXPENSES			
NET OVER ANNUAL \$/acre			
OPERATING EXPENSES			
BREAKEVEN PRICE/UNIT FOR PRIMARY PRODUCT			
TO COVER ANNUAL OPERATING EXPENSES			

FORWARD PLANNING CONCEPTS

Managing a business is similar to charting a course for a ship. The manager does the charting. To be effective, he must have goals. He must continually gather and analyze facts. On the basis of his analysis, he must make decisions and carry them out. The process is never ending. New information and analyses require alterations just as a change of wind and weather requires the captain of the ship to make frequent changes in guiding his vessel.¹

Different types of analyses can be performed on a farm business. A descriptive analysis attempts to determine the current situation of the business. A second type is a diagnostic analysis that is concerned with detecting strengths and areas for improvement in the business. The Dairy Farm Business Summary Program conducted by Cornell University combines these two types of analyses, by analyzing financial statements and calculating analysis factors such as feed cost per cow and capital turnover ratio. Some managers do not go beyond this point. The third analysis type, predictive analysis, combines information from the descriptive and diagnostic analysis plus projected changes in farm size (acres or number of livestock) and production prices and costs. A predictive analysis or forward planning forms the basis for planning the future of the business and is a key to successful farm management. The templates are an aid to predictive analyses of the cropping program.

There are seven distinct but interrelated steps in forward farm planning:²

1. Appraisal of goals and objectives.
2. Inventory of resource availability.
3. Selection of alternatives to be analyzed.
4. Selection of input/output information to be used in the analysis process.
5. Selection of prices to be used in the analysis process.
6. Organization of input/output and price information into an appropriate analysis structure.
7. Analysis of alternatives.

Each step is discussed in detail by Harsh, et al. and in a number of other farm management texts. The first five steps may be the most difficult, but many farm managers may be reluctant to begin the process without a way to easily organize the information and use it to analyze their alternatives. The templates are tools for performing these organization and analysis steps.

¹L. H. Brown and J. A. Speicher, "Business Analysis for Dairy Farms," Extension Bulletin E-685, Michigan State University, East Lansing, Michigan, June 1970.

²S. B. Harsh, L. J. Connor and G. D. Schwab, Managing the Farm Business (Englewood Cliffs, N.J.: Prentice-Hall, 1981), p. 178.

Fixed and Variable Costs

With the cost-price squeeze in agriculture becoming more severe, farmers often express concern for minimizing costs. It is important from a managerial viewpoint that the specific type of cost being discussed be clarified. It should also be stressed that minimizing costs does not necessarily lead to maximizing profits.

The distinction between fixed and variable costs is fundamental to economics. Unfortunately, it is often one of the most misunderstood and misused distinctions. By definition, fixed costs do not change with the volume of output for a particular enterprise. Fixed costs normally include such items as depreciation, interest on investment, taxes, insurance and some repairs (sometimes referred to as the DIRT-5). While the total dollar amount of fixed costs does not change with volume of output, the average fixed cost per unit (acre or unit of crop output) declines as output increases. Variable costs, on the other hand, do change with the volume of output.

The breakdown of specific cost items as variable or fixed depends on the time period considered, however. In the long run, as all inputs become variable, all costs also become variable. Put another way, whether a specific cost item should be considered variable or fixed depends on the decision at hand. If the decision is a long run one such as whether to purchase a complete farm business, then all of the costs involved can be avoided by deciding not to make the purchase (and of course the potential profits are avoided as well). All costs would vary, at least in that they would be incurred or avoided.

Contrast this with a situation where a crop has been planted, and a drought occurred so that yields are very low. The decision is whether to harvest, which will only be done if the reduced yield is enough to cover harvesting costs. Then, the only variable costs are for harvesting - none of the growing costs can vary at that point in time.

Many published crop enterprise planning budgets include a breakdown showing seed, fertilizer, chemicals, machinery operating labor and interest on operating capital as variable expenses, and costs for ownership or rental of capital items such as machinery, equipment, buildings and land as fixed. This breakdown is usually appropriate for making year-to-year changes in crop acreages. However, it should be clear from this discussion that for many other short- and longer-run decisions, some of these "fixed" costs may really vary, and vice versa. One example is for a change in crop acreage where machinery purchases are made.

Unlike many enterprise budgets, land costs and machinery equipment or building ownership costs are not allocated to individual crops. These costs are included only in the totals for all crops. For analyzing specific decisions, an allocation of costs for capital items to individual crops adds complexity and is arbitrary and irrelevant at best. At worst, focusing on return over such allocated costs on a per acre basis rather than the impact on total farm profitability could lead to wrong conclusions about profitability.

For example, suppose that a 130 horsepower tractor is used to grow 100 acres of corn and 100 acres of hay. Its annual ownership cost is estimated to be \$5000. It is used two hours per acre on the corn, or 200 hours, and three hours per acre on the hay, or 300 hours, for a total of 500 hours per year or \$10 per hour. Allocating the cost on an hourly basis would give a charge of \$20 per acre for corn and \$30 per acre for hay. This has been the practice followed by the author and others, and is useful as a general guide. One could also argue for an allocation on a straight acreage basis, giving \$25 per acre for each crop. But suppose an 80 horsepower tractor with a cost of \$3500 per year is sufficient for hay while the larger tractor is required to perform corn tillage in a timely fashion. What then is an economically rational allocation of the \$5000 cost between corn and hay? The total ownership cost of \$5000 is fairly clear and should be considered in an analysis where alternatives include purchasing or not purchasing the tractor.

Suppose further that the alternative to purchasing the tractor and growing the 100 acres of corn and 100 acres of hay is to use machinery already on hand to grow hay on all 200 acres. The net return from growing hay apart from the tractor ownership cost is \$40 per acre, and \$35 per acre for corn.

	Hay	Corn
Net over other costs	\$40	\$35
Tractor ownership	- 30	- 20
Net	\$10	\$15

If we look only at the per acre costs, and allocate the tractor ownership cost on the basis of hours of use, we might draw the conclusion that shifting to corn and purchasing the tractor would be the more profitable choice. However, look at the farm totals.

	200 A. Hay	100 A. Hay & 100 A. Corn
Net over other costs	\$8000	\$7500
Tractor ownership	- 3500	- 5000
Net	\$4500	\$2500

It is clear from comparing the farm totals that growing all hay and not purchasing the tractor is the more profitable option.

Partial Budgeting

Crop inputs used, yields and price information must be organized for analysis. Partial budgeting is a forward planning technique for organizing this information to project costs and returns that change with a proposed adjustment in a segment of the business. Other costs and returns that do not change are ignored.

Enterprise budgets are commonly used to simplify partial budgeting. Enterprise budgets are prepared by stating the income, expenses, and resource needs of a productive activity, such as a particular crop, on a per unit basis (usually an acre). The income, expenses, and resource needs are treated as a package in examining changes.

The procedure for doing a partial budgeting analysis is a three-step process. The first step is identifying those factors that will (1) increase income or (2) reduce costs. The second step is concerned with those factors that (1) decrease income or (2) increase costs. Finally, the gains identified in the first step are compared to the losses identified in the second step.

METHODS USED TO ESTIMATE COSTS

The "economic engineering" approach is used to calculate machinery ownership and operating costs and hours of machine operating labor per acre. In this approach, engineering formulas are used to calculate hours required to cover an acre for each machine based on width, speed and field efficiency. Other formulas are used to estimate fuel use and repair costs on an hourly and per acre basis.

Field Capacity

The time required to cover an acre is the first calculation for each machine. This is called its "field capacity". The field capacity of a machine is a function of the machine capacity, field efficiency and operating speed. Machine capacity is the width of the machine. For example, with a grain combine, it is the width of the grain head. For a corn planter, machine width is the number of rows times the row spacing.

Field efficiency is the percentage of the theoretical field work accomplished after deducting for losses resulting from failure to use the full width of the machines, turning and idle travel at the ends, clogging, filling and adjusting seed, fertilizer and spray materials, unloading harvested crops, machine adjustments and minor repairs, lubrication, and other minor interruptions. It excludes waiting for supplies, wagons or trucks, major breakdowns, and daily service activities. Field efficiency for a particular machine varies with the size and shape of the field, field obstructions, pattern of the field operation, crop yield, moisture and crop conditions. The size of the machine also influences the field efficiency. Efficiency is reduced as larger machines are used. For example, the efficiency of corn planters and corn tillage tools is reduced about one percent for each row added, discs about one percent for each 30 inches of added width and moldboard plows about two percent per bottom added.

The speed of the implement is influenced by the size of power unit, the draft of the implement, the physical characteristics of the land, and the dexterity of the operator. Generally, the effective speed of the implement determines the rate of travel.

The time required to cover an acre is computed by using the following formula:

$$\text{Hours/acre} = \frac{8.25 \times \text{times over the field}}{\text{width(ft.)} \times \text{speed (m.p.h.)} \times \text{field efficiency (decimal)}}$$

Typical speeds and field efficiencies are shown in Table 1.

Operating and Ownership Costs

Costs of using new or used machinery can be categorized into two groups, operating or variable costs and ownership or fixed costs. Operating costs include fuel and lubrication, repairs and labor. Operating costs per acre should be entered into CROPMN10 on a per acre basis, from farm records or crop enterprise budgets of similar or typical situations.

Ownership costs include depreciation, interest, taxes, insurance and housing.

Depreciation is the decline in value over the life of the machine. For tax purposes depreciation can be computed by the straight line method, the sum of digits method or the declining balance method. Assuming a reasonable salvage value, which method of depreciation will give the greatest amount of depreciation over the life of the machine? Each method will give the same amount of depreciation over the life of the machine. Furthermore, if a farmer depreciates a machine to a very low salvage value and then trades for another machine, the new machine will have a lower cost to be depreciated over its life. However, the actual total depreciation can never be known until the machine is sold or traded. With recent price increases for new machinery, many used items sell for prices greater than their original purchase price. Straight-line depreciation is the method used in the template.

Interest on investment is the annual interest charge on the undepreciated value of machinery. Many farmers do not think of interest as a cost unless they borrow money to purchase a machine. Even though money is not borrowed, interest charges should be considered because funds could be invested elsewhere and earn a return.

Insurance must be included as a cost of operation. Liability coverage should be included because tractors and other machinery may be involved in accidents resulting in liability claims. There may also be losses as a result of fire or high winds. Generally, farmers do not insure individual machines, but have a blanket policy. A common rate is \$5 per \$1000 valuation or 0.5 percent of the remaining value at the beginning of the year.

Housing is another cost of using machinery. Some machinery repair indicate that housing may increase the life of the machine, which in turn may be reflected in the trade-in value. Typical housing costs are 1.5% of the beginning yearly value.

Taxes are levied against personal property in some states. New York does not have a personal property tax.