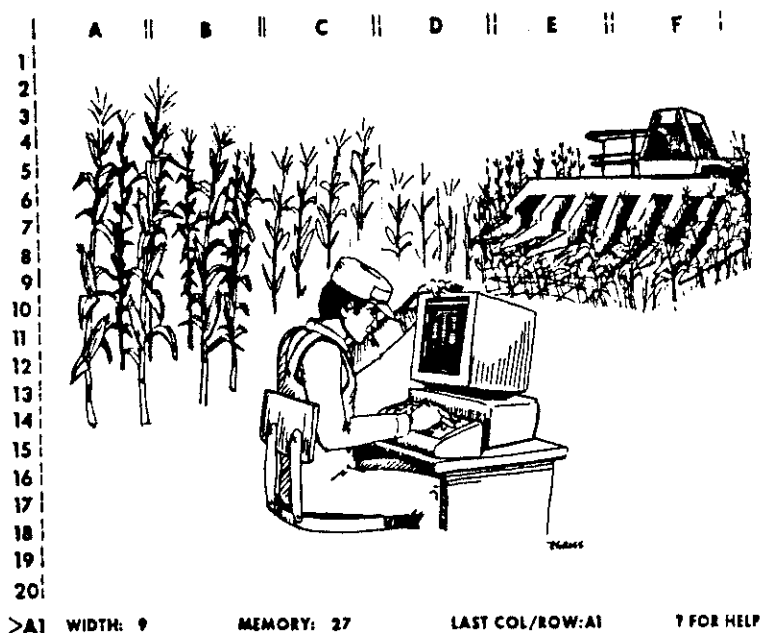# CROP DECISION ANALYSIS
WITH MACHINE CALCULATIONS

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. 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 Darwin P. Snyder for helpful suggestions and review during development of the CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS templates.

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                       |--5
                       |--QUIT
MACHINE
PRODUCT
FARM
BASE
PRINT------------------|--1
                       |--2
                       |--3
                       |--4
                       |--5
                       |--ALL
                       |--QUIT
QUIT
```

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```
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                       |--ANN_HRS-----|--TRACTORS
                                      |--IMPLEMENTS
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                                      |--IMPLE&TRAC
                                      |--QUIT

                       |--OWNERSHIP---|--TRACTORS
                                      |--IMPLEMENTS
                                      |--QUIT

                       |--PRINT
                       |--QUIT
QUIT
```

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```
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PRICE
ACRES
USE
CALCULATE-------------|--HOURS
                      |--FUEL&OIL
                      |--REPAIRS
                      |--OWNERSHIP
                      |--PRINT
                      |--QUIT

QUIT
```

CROP DECISION ANALYSIS
WITH MACHINE CALCULATIONS

Spreadsheet Templates and

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 cropland.

2. Changing the mix of crops grown.

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 CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS templates calculate annual operating costs and returns per acre for each of up to five crop enterprises and farm totals. They also calculate machinery operating and ownership costs for all machines used on the crops being considered.

Operating and ownership costs for tractors and other machines are calculated in one template. This template is designed to accommodate six tractors or other power units and 21 implements. The types of input data needed to set up the template include: purchase price and list price if different from purchase price; width of machine; average operation speed;

field efficiency; age of machine at purchase and years owned; salvage value; interest, insurance and storage rates; fuel price; acreage of each crop; and number of times over the field by each machine for each crop. A self-propelled machine such as a combine is accommodated by entering the power unit in place of a tractor and entering the header attachments in place of pull-type machines. Sample worksheets are provided for organizing the required input data.

A second template calculates ownership and operating costs for up to five trucks or other vehicles. Operating costs are based on miles driven per year and allocated to crops based on acres, production or other user-defined weights.

The last template calculates costs and returns per acre for each of up to five crop enterprises, using the machinery operating and ownership costs calculated previously.

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 384K 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

A 5 1/4" diskette copy of 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 overriden. The user bears responsibility for seeing that any changes are done properly.

TEMPLATE USERS MANUAL

Three templates are provided on the diskette, as shown in the directory listing below. MACH is the template that is used for the machinery calculations. TRUCK does the cost calculations for trucks. The summary numbers from each of these is transferred using macros to CROP, where the crop enterprise budget data is entered.

```
AUTODEX File List: 042486      Id:  CROP      Disk Left:  167K bytes

                              Change
   Filename        Size       Date      Description
------------       ----      -----      -------------------------------------

CROP     WKS       28K       041686
MACH     WKS      105K       041686      Crop acres and enterprise budgets
TRUCK    WKS       21K       04186       Machine operating & ownership costs
                                         Truck operating & ownership costs
```

The other two files on the disk, --CROP.DID and AUTODEX.EXE, are a public domain utility program that is not related to the template.

Making Backup Copies

Before starting your first session you should protect your 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 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> <DEL> keys simultaneously.

2- Label a blank diskette as "CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS - 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 CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS program diskette and press the <ENTER> key.

6- When the copy is complete remove the original diskette from drive A and put it in a safe location.

7- Use your working copy of CROP DECISION ANALYSIS WITH MACHINE CALCULATIONS as the daily working copy.

Starting Up - CROP Template

Load the CROP 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 CROP

(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, except for the menu in the second and third lines.

The template is menu driven through three 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

The template is divided into six areas (Figure 2). The first five can be reached by making selections from the menu. The first, ACRES, is where a description of each crop and acres grown are entered. The second, 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.

All 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.

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. The cursor will move only to the cells where data entry is allowed. Headings and formulas will be skipped over. Pressing the return key without making an entry will then allow you to move the cursor to any cell, not just the data entry cells. Pressing return a second time will bring up the menu again so you can select another option.

Figure 1. CROP Introductory Screen

```
C81:  '                          Cornell University
                                                                                    READY
        B          C          D          E          F              G
 64   V2.0
 65        Crop Management Decision Analysis w/Machine Cost Calculations  December 12, 1986
 66        -----------------------------------------------------------------
 67             Purpose - budgetting impacts of changes in crop acres,
 68                yields, prices and input rates per acre, and machinery
 69                              ownership costs.
 70             Use - Enter acres of each crop in ACRES.
 71             Save, then enter machine data in MACH & TRUCK templates.
 72             Reload CROP and use MACHINE to transfer machine data.
 73             Menu directs you to budget worksheets for up to 5 CROPs.
 74             Farm totals are then shown (select FARM from menu).  Land
 75             costs including rent and taxes are entered here as well.
 76             Enter budgets for base situation, then change.
 77
 78
 79
 80              Developed and Programmed by William F. Lazarus
 81                     Department of Agricultural Economics
 82                             Cornell University
 83
                        FOR COMMAND BAR MENU PRESS Alt M
                                                    CALC
```

Figure 2.   Layout of CROP Template

CROPS	ACRES	FARM

Introduction & Macros

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.

ACRES

Selecting the first option, ACRES, takes you to the area of the worksheet shown in Figure 3. The first two lines are provided to enter your name and location, in case several analyses are being made. Then enter a description for each crop, and acres grown. The bottom three lines are provided to enter land or other expenses, other than crop annual expenses or machinery ownership costs, that you want to include. At this point, select QUIT to get out of the macro and back to normal mode. Then /File Save the file under your own file name, and load the MACH template to continue.

FIGURE 3. Name, Crops Grown and Undistributed Expenses

READY

ALB: U 'Hay

	AJ	AK	AL	AM	AN	AO
2		NAME:	Dairy Farm			
3		LOCATION:	NYS			
4		ACRES OF EACH CROP				Total Quantity
5		===================			Acres	Prod. 1
6		Crop No.	Crop Description		-----	--------
7		--------	----------------		50	150
8		CROP 1	Hay		150	450
9		CROP 2	HCS		180	3060
10		CROP 3	C Silg		120	636
11		CROP 4	HMEC		0	0
12		CROP 5			500	
13		TOTAL ACRES				TO SEE UNITS A1
14		CHANGES IN LAND OR OTHER EXPENSES, OTHER THAN				
15		CROP ANNUAL EXPENSES OR MACHINERY OWNERSHIP COSTS				
16		===				
17		Item	Farm Total			
18		----	----------			
19		Land	$15,000.00			
20		Taxes	$0.00			
21		Miscellaneous	$0.00			

MACH Template

Load MACH and you should see Figure 4. MACH requires a 132-column printer. It comes with a /Print Printer Options Setup code \015 to print in small (compressed) print on an IBM or Epson printer. If you use a printer using another code for compressed print, use

/Print Printer Options Setup

to make the change.

Alt M brings up a menu with six options.

FIGURE 4. MACH Introductory Screen

A1: 'V1.1

                                                                    READY

        A   B   C   D   E   F   G   H
1   V1.1
2   April 16, 1986
3
4
5   MACH: TEMPLATE TO CALCULATE COST TO OWN AND
6   OPERATE TRACTORS AND OTHER POWER UNITS
7   AND THE IMPLEMENTS USED WITH THEM.
8
9   FOR COMMAND BAR MENUS Press Alt M for Input
10
11   Or Press Alt R to Show Results
12
13   (C)Copyright 1986 by William F. Lazarus
14   NAME:
15   LOCATION: Dairy Farm
16   NYS
17
18
19
20

                                                CALC

ACRES

     The first option prompts you for the name of the crop budget file - CROP or your own file name - you used when storing the crop template with your crop descriptions and acreages. When you enter that file name, this information is transferred to MACH for use in calculating the machinery operating costs and their allocation to crops. Your screen should look like Figure 5.

FIGURE 5. Transferring CROP Acres to MACH

```
                                                                    READY

   I4: U 'Hay


              I          J      K         L        M      N        O
   2    Enter Name of File Containing Crop Names and Acres
   3
   4    Hay                  50.00
   5    HCS                 150.00
   6    C Silg              180.00
   7    HMEC                120.00
   8                          0.00
   9
  10
  11
  12
  13
  14
  15
  16
  17
  18
  19
  20
  21                                               CALC
```

TRACTOR

This takes you to an area where the purchase prices and ownership and operating cost factors for up to six tractors are entered. You should see Figure 6.

Note: This template calculates repair and maintenance costs based on accumulated hours of use for each machine over its life. For this estimate to be accurate, all of the machine use must be reflected for each machine. Tractors, especially, can be a problem if they are used for operations such as spreading manure that may be overlooked.

You have the option of entering extra non-crop tractor annual hours of use in row 43. This is added to hours of use for the crops entered to arrive at total annual hours of use.

FIGURE 6. Tractor Input Data

```
C30: U ' 125 hp

                                                                    READY

         A          B          C          D          E          F          G          H
22  ********************************************************************
23  Enter the tractor data starting in column C
24  and continuing towards the right over to column H. Data
25  for up to 6 tractors can be entered if needed.
26  ********************************************************************
27
28       INPUT VARIABLES FOR EACH MACHINE:
29  Tractor #               1          2          3          4          5          6
30  Tractor Type        125 hp      80 hp      60 hp      blank      blank      blank
31                      tractor    tractor    tractor    tractor    tractor    tractor
32  Purchase Price      $37,214    $22,312    $17,195
33  List Price          $45,450    $27,250    $21,000                                 $0
34  PTO HP                  125         80         60                                 $0
35  Fuel price            $1.10      $1.10      $1.00                                  0
36                                                                                 $0.00
37  Fuel,oil coef        0.0504     0.0504      0.069
38  Repair Group #            1          1          1                                  0
39    estim life (hrs)   12,000     12,000     12,000                                  1
40  Accum. Hrs at Purc        0          0          0                                  0
41  Years Owned              10         10         10                                  0
                                                               CALC                    0
```

IMPLEMENT

     The third option takes you to the area where the implement prices and cost factors are entered in Figure 7.

FIGURE 7. Implement Input Data

K30: U '   Plow

	I	J	K	L	M	N	O
30	Implement Type		Plow	Disc	Forage	Grass	3R Corn
31			5-18	13'	Harvstr	Head	Head
32	Purchase Price		$8,147	$5,732	$16,443	$3,758	$7,141
33	List Price		$9,950	$7,000	$17,500	$4,000	$7,600
34	Width in Feet		7.5	13	12	12	7.5
35	Speed in MPH		4	4.5	3	3	3
36	Field Efficiency		80%	80%	65%	65%	65%
37	Fuel Multiplier		1.33	1.33	0	1.33	1.33
38	Repair Group #		3	3	6	6	6
39	estim life (hrs)		2,500	2,500	2,000	2,000	2,000
40	Years Old at Purchase		0	0	0	0	0
41	Years Owned		10	10	6	6	6
42	Salvage Rate		20%	20%	30%	30%	30%
43	# of Tractor Used		1	1	1	1	1
44	Tractor Hrs % of Impl		100%	100%	0%	100%	100%
45							
46							
47							
48							
49							

TRIPS

The third option prompts you for the number of times each implement is used on each crop each year. (If a crop is sprayed three times over the growing season, enter "3" for the sprayer) (Figure 8).

FIGURE 8. Implement Use by Crop

K56: U 0.25   CALC

                                                              READY

	I	J	K	L	M	N	O
30	Implement Type		Plow	Disc	Forage	Grass	3R Corn
31			5-18	13'	Harvstr	Head	Head
56	Crop 1	Grow	0.25	0.25			
57	Hay	Harv					
58	Crop 2	Grow	0.25	0.25			
59	HCS	Harv					
60	Crop 3	Grow	1.00	1.00	2.50	2.50	
61	C Silg	Harv					
62	Crop 4	Grow	1.00	1.00	1.60		1.00
63	HMEC	Harv					
64	Crop 5	Grow			2.40		
65		Harv					
66							

```
67  ************************************************************
68  THIS COMPLETES DATA ENTRY FOR THE POWER UNIT AND THE
69  MACHINES USED WITH IT. Detailed calulations of machine time,
70  fuel, oil, repairs and ownership costs are summarized in
71  column P and transfered to the crop budget template.
72  ************************************************************
73
```

                                                    CALC

CALCULATE

The machinery cost templates are manually recalculated. This option calculates, then takes you to another menu that in turn moves you to different areas of the results section. To avoid recalculating, the results menu can also be called directly using Alt R. The PRINT option prints out the template. It is advisable to save the template under your own file name before printing, in case any problems occur during printing. QUIT returns you to normal mode. Figure 9 shows the layout of MACH. Figure 10 is a sample printout.

FIGURE 9. Layout of MACH Template

FIGURE 10.   Sample Printout of Machine Cost Data

Machine Cost Data

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Hay	50.00
HCS	150.00
CS	180.00
HMEC (33% mc)	120.00
	0.00

Tractor #	1	2	3	4	5	6
Tractor Type	125 hp tractor	80 hp tractor	60 hp tractor	blank tractor	blank tractor	blank tractor
Purchase Price	$37,214	$22,312	$17,195			
List Price	$45,450	$27,250	$21,000			$0
PTO HP	125	80	60			$0
Fuel price	$1.10	$1.10	$1.00			0
						$0.00
Fuel,oil coef	0.0504	0.0504	0.069			
Repair Group #	1	1	1			0
estim life (hrs)	12,000	12,000	12,000			1
Accum. Hrs at Purc	0	0	0			0
Years Owned	10	10	10			0
Salvage Rate	40%	40%	40%			0
Annual Non-Crop Hr	0	0	0			0%
Interest Rate	12.0%					0
Insurance Rate	0.5%					
Storage Rate	1.5%					

SUMMARY DATA

Repair Coef 1	0.12	0.12	0.12	0.01	0.01	0.12
Repair Coef 2	1.5	1.5	1.5	1.0	1.0	1.5
	Tractor 1	Tractor 2	Tractor 3	Tractor 4	Tractor 5	Tractor 6
Trac Hrs Use/Yr	517.30	271.01	311.57	0.00	0.00	0.00
Accum Hrs at Purch	0.00	0.00	0.00	0.00	0.00	0.00
Accum Hrs Over Lif	5173.00	2710.10	3115.68	0.00	0.00	0.00
R&M Cost/Hr	2.98	1.29	1.07	0.00	0.00	0.00
Fuel Cost $/Hr	6.93	4.44	4.14	0.00	0.00	0.00

Machine Cost Data

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TOTAL OWNERSHIP COSTS

Tractor	1	2	3	4	5	6
% OF PUR PRICE	16%	16%	16%	0%	0%	0%
TOTAL COST/YR.	6103.10	3659.17	2819.98	0.00	0.00	0.00

Machine Cost Data

Implement Type	Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Purchase Price	$8,147	$5,732	$16,443	$3,758	$7,141	$7,235	$8,456	$2,866	$1,801	$13,146	$10,879
List Price	$9,950	$7,000	$17,500	$4,000	$7,600	$7,700	$9,000	$3,500	$2,200	$14,500	$12,000
Width in Feet	7.5	13	12	12	7.5	5	12	15	16	12	12
Speed in MPH	4	4.5	3	3	3	3	3	4.5	5	4.5	2.5
Field Efficiency	80%	80%	65%	65%	65%	65%	65%	80%	80%	70%	70%
Fuel Multiplier	1.33	1.33	0	1.33	1.33	1.33	0	0.67	1	1	1
Repair Group #	3	3	6	6	6	6	7	3	3	7	6
estim life (hrs)	2,500	2,500	2,000	2,000	2,000	2,000	5,000	2,500	2,500	2,000	2,500
Years Old at Purchase	0	0	0	0	0	0	0	0	0	0	0
Years Owned	10	10	6	6	6	6	6	10	10	7	10
Salvage Rate	20%	20%	30%	30%	30%	30%	20%	20%	20%	20%	20%
# of Tractor Used	1	1	1	1	1	1	1	2	2	2	2
Tractor Hrs % of Impl	100%	100%	0%	100%	100%	100%	0%	100%	100%	100%	100%

Implement Type		Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Crop 1	Grow	0.25	0.25							0.25	3.00	2.50
Hay	Harv											
Crop 2	Grow	0.25	0.25							0.25	3.00	
HCS	Harv			2.50	2.50			2.50				
Crop 3	Grow	1.00	1.00						1.00	1.00		
CS	Harv			1.60		1.00		1.60				
Crop 4	Grow	1.00	1.00						1.00	1.00		
HMEC (33% mc)	Harv			2.40			1.00					
Crop 5	Grow											
	Harv											

Implement Type	Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
HRS/A PER TRIP Hrs/A	0.34	0.18	0.35	0.35	0.56	0.85	0.35	0.15	0.13	0.22	0.39

IMPL HRS/A BY CROP

		Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Crop 1	Grow	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
Hay	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.98
Crop 2	Grow	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.65	0.00
HCS	Harv	0.00	0.00	0.88	0.88	0.00	0.00	0.88	0.00	0.00	0.00	0.00
Crop 3	Grow	0.34	0.18	0.00	0.00	0.00	0.00	0.00	0.15	0.13	0.00	0.00
CS	Harv	0.00	0.00	0.56	0.00	0.56	0.00	0.56	0.00	0.00	0.00	0.00
Crop 4	Grow	0.34	0.18	0.00	0.00	0.00	0.00	0.00	0.15	0.13	0.00	0.00
HMEC (33% mc)	Harv	0.00	0.00	0.85	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.00
Crop 5	Grow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TRACTOR HRS/A BY CROP

		Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Crop 1	Grow	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
Hay	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.98
Crop 2	Grow	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.65	0.00
HCS	Harv	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop 3	Grow	0.34	0.18	0.00	0.00	0.00	0.00	0.00	0.15	0.13	0.00	0.00
CS	Harv	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00
Crop 4	Grow	0.34	0.18	0.00	0.00	0.00	0.00	0.00	0.15	0.13	0.00	0.00

Machine Cost Data

Implement Type		Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
HMEC (33% mc)	Harv	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.00
Crop 5	Grow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUMMARY DATA

	Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Repair Coef 1	0.301	0.301	0.127	0.127	0.127	0.127	0.159	0.301	0.301	0.159	0.127
Repair Coef 2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.4	1.4
Impl Hrs use/yr	120.31	61.70	335.29	132.21	101.54	101.54	233.75	45.83	45.12	130.95	49.11
Accum Hrs at Purchase	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Accum Hrs Over Life	1203.13	616.99	2011.73	793.27	609.23	609.23	1402.50	458.33	451.17	916.67	491.07
Impl R&M Cost/Hr	3.83	2.21	7.03	1.11	1.89	1.92	1.09	1.01	0.63	5.32	2.01
Trac R&M Cost/Hr	2.98	2.98	0.00	2.98	2.98	2.98	0.00	1.29	1.29	1.29	1.29
Fuel Cost $/Hr	9.22	9.22	0.00	9.22	9.22	9.22	0.00	2.97	4.44	4.44	4.44

IMPL REPAIR & MAINTANENCE COST/A

		Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Crop 1	Grow	0.33	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Hay	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.49	1.97
Crop 2	Grow	0.33	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
HCS	Harv	0.00	0.00	6.19	0.98	0.00	0.00	0.96	0.00	0.00	3.49	0.00
Crop 3	Grow	1.32	0.39	0.00	0.00	0.00	0.00	0.00	0.15	0.08	0.00	0.00
CS	Harv	0.00	0.00	3.96	0.00	1.07	0.00	0.61	0.00	0.00	0.00	0.00
Crop 4	Grow	1.32	0.39	0.00	0.00	0.00	0.00	0.00	0.15	0.08	0.00	0.00
HMEC (33% mc)	Harv	0.00	0.00	5.95	0.00	0.00	1.62	0.00	0.00	0.00	0.00	0.00
Crop 5	Grow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

FUEL COST PER ACRE

		Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Crop 1	Grow	0.79	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00
Hay	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90	4.36
Crop 2	Grow	0.79	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00
HCS	Harv	0.00	0.00	0.00	8.12	0.00	0.00	0.00	0.00	0.00	2.90	0.00
Crop 3	Grow	3.17	1.62	0.00	0.00	0.00	0.00	0.00	0.45	0.57	0.00	0.00
CS	Harv	0.00	0.00	0.00	0.00	5.20	0.00	0.00	0.00	0.00	0.00	0.00
Crop 4	Grow	3.17	1.62	0.00	0.00	0.00	0.00	0.00	0.45	0.57	0.00	0.00
HMEC (33% mc)	Harv	0.00	0.00	0.00	0.00	0.00	7.80	0.00	0.00	0.00	0.00	0.00
Crop 5	Grow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(TRACTOR + IMPL) REPAIR & MAINTANENCE COST/A

		Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
Crop 1	Grow	0.59	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Hay	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33	3.24
Crop 2	Grow	0.59	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
HCS	Harv	0.00	0.00	6.19	3.61	0.00	0.00	0.96	0.00	0.00	4.33	0.00
Crop 3	Grow	2.34	0.91	0.00	0.00	0.00	0.00	0.00	0.35	0.25	0.00	0.00
CS	Harv	0.00	0.00	3.96	0.00	2.75	0.00	0.61	0.00	0.00	0.00	0.00
Crop 4	Grow	2.34	0.91	0.00	0.00	0.00	0.00	0.00	0.35	0.25	0.00	0.00
HMEC (33% mc)	Harv	0.00	0.00	5.95	0.00	0.00	4.15	0.00	0.00	0.00	0.00	0.00
Crop 5	Grow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Harv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Machine Cost Data

Implement Type	Plow 5-18	Disc 13'	Forage Harvstr	Grass Head	3R Corn Head	2R Sn Head	Dump Wagon	6R Cult	Drag 16'	Mower 12'	Baler w/kickr
TOTAL OWNERSHIP COSTS											
Implement											
% OF PUR PRICE	17%	17%	21%	21%	21%	21%	23%	17%	17%	21%	17%
TOTAL COST/YR.	1401.28	985.90	3529.76	806.72	1532.93	1553.11	1905.42	492.95	309.77	2711.83	1871.19

TRUCK Template

When you load TRUCK, you should see Figure 11 on your screen. The layout is similar to MACH. Again, Alt M gives you a menu. PRICE takes you to the area where purchase prices and cost factors are entered. ACRES transfers crop descriptions and acres from the crop budget file. USE takes you to a screen where relative use is entered by crop (Figure 12).

Truck operating costs can be allocated to crops based on acreage with the same per acre cost to each; based on quantities of crop production hauled for each crop; or other criteria. Enter crop acreage to allocate by crop, total production to allocate on that basis, or use any other weighting scheme that reflects your situation. The template calculates a set of proportions based on the entries in rows 38 through 47, and uses these for the allocation.

FIGURE 11. TRUCK Introductory Screen

A1: 'V1.1

```
                                                                    READY
       A          B        C        D        E        F
 1  V1.1                                                      G         H
 2                                                       April 16, 1986
 3
 4
 5          TRUCK:   TEMPLATE TO CALCULATE COST TO OWN AND
 6                   OPERATE A TRUCK.
 7
 8
 9             FOR COMMAND BAR MENU Press Alt M
10
11             Or Press Alt R to Show Results
12
13
14
15
16
17
18
19
20


                                       CALC
```

FIGURE 12.   Truck Use By Crop

E38: U 50

	B	C	D	E	F	G	H	I
								criteria
36	ENTER RELATIVE TRUCK USE ON EACH CROP – based on acres or other criteria							
37							.00	.00
38	Crop 1 Grown			50.00				
39	Crop 1 Harvested			50.00				
40	Crop 2 Grow			150.00				
41	Crop 2 Harvested			150.00	225.00	225.00		
42	Crop 3 Grown			180.00				
43	Crop 3 Harvested			180.00	510.00	510.00		
44	Crop 4 Grown			120.00				
45	Crop 4 Harvested			120.00				
46	Crop 5 Grown			0.00				
47	Crop 5 Harvested			0.00	735.00	735.00	.00	.00
48	total			1000.00				
49								
50	***							
51	THIS COMPLETES DATA ENTRY FOR THE TRUCK.							
52	Detailed calulations of machine time,							
53	fuel, oil, repairs and ownership costs are summarized in							
54	column P and transfered to the crop budget template. Data							
55	entry for power unit #2 starts at cell A129.						CALC	CAPS

     Figure 13 is a sample printout from TRUCK /File.   Save TRUCK and
/File Retrieve CROP (or your name) again.

FIGURE 13.   Sample Printout of Truck Cost Data

Truck Cost Data   10-Jun-86   1

Hay	50.00
HCS	150.00
C Silg	180.00
HMEC	120.00
	0.00
Total Acres	500

INPUT VARIABLES		blank	blank	blank	blank
Purchase Price	$9,825	$6,550	$6,550		
List Price	$12,000	$8,000	$8,000		
Miles/yr	7000	2500	2500		
MPG	12	4	4		
Fuel Price $ /gal.	$1.15	$1.15	$1.15		
Typical Speed Miles/Hr	35	20	20	0	0
Years Old at Purchase	0	6	6		
Years Owned	10	10	10		
Estimated Life (hrs)	2000	2000	2000		
Salvage Rate %	10%	10%	10%		
Interest Rate %	12%	12%	12%		
Insurance Rate $/yr	$480	$200	$200		
Storage Rate %	1.5%	1.5%	1.5%		

ENTER RELATIVE TRUCK USE ON EACH CROP - based on acres or other criteria

Crop 1 Grown	50.00				
Crop 1 Harvested	50.00			.00	.00
Crop 2 Grow	150.00				
Crop 2 Harvested	150.00	225.00	225.00		
Crop 3 Grown	180.00				
Crop 3 Harvested	180.00	510.00	510.00		
Crop 4 Grown	120.00				
Crop 4 Harvested	120.00				
Crop 5 Grown	0.00				
Crop 5 Harvested	0.00				
total	1000.00	735.00	735.00	.00	.00

INPUT VARIABLES		blank	blank	blank	blank
Purchase Price	$9,825	$6,550	$6,550		
HOURS PER ACRE BY CROP					
Crop 1 Grow	0.20	0.00	0.00	0.00	0.00
Crop 1 Harv	0.20	0.00	0.00	0.00	0.00
Crop 2 Grow	0.20	0.00	0.00	0.00	0.00
Crop 2 Harv	0.20	0.26	0.26	0.00	0.00
Crop 3 Grow	0.20	0.00	0.00	0.00	0.00
Crop 3 Harv	0.20	0.48	0.48	0.00	0.00
Crop 4 Grow	0.20	0.00	0.00	0.00	0.00
Crop 4 Harv	0.20	0.00	0.00	0.00	0.00
Crop 5 Grow	0.00	0.00	0.00	0.00	0.00
Crop 5 Harv	0.00	0.00	0.00	0.00	0.00

INPUT VARIABLES		blank	blank	blank	blank
Purchase Price	$9,825	$6,550	$6,550		
SUMMARY DATA					
repair coef 1	0.096	0.096	0.096	0.096	0.096
repair coef 2	1.4	1.4	1.4	1.4	1.4
Hours use per yr	200.00	125.00	125.00	0.00	0.00
Accum Hrs at Purchase	0.00	750.00	750.00	0.00	0.00
Accum Hrs Over Life	2000.00	2000.00	2000.00	0.00	0.00
R&M Cost/Hr	3.63	2.89	2.89	0.00	0.00

Truck Cost Data   10-Jun-86 3

INPUT VARIABLES		blank	blank	blank	blank
Purchase Price	$9,825	$6,550	$6,550		
FUEL COST PER ACRE					
Crop 1 Grow	0.67	0.00	0.00	0.00	0.00
Crop 1 Harv	0.67	0.00	0.00	0.00	0.00
Crop 2 Grow	0.67	0.00	0.00	0.00	0.00
Crop 2 Harv	0.67	0.86	0.86	0.00	0.00
Crop 3 Grow	0.67	0.00	0.00	0.00	0.00
Crop 3 Harv	0.67	1.62	1.62	0.00	0.00
Crop 4 Grow	0.67	0.00	0.00	0.00	0.00
Crop 4 Harv	0.67	0.00	0.00	0.00	0.00
Crop 5 Grow	0.00	0.00	0.00	0.00	0.00
Crop 5 Harv	0.00	0.00	0.00	0.00	0.00

REPAIR AND MAINTANENCE COST PER ACRE					
Crop 1 Grow	0.73	0.00	0.00	0.00	0.00
Crop 1 Harv	0.73	0.00	0.00	0.00	0.00
Crop 2 Grow	0.73	0.00	0.00	0.00	0.00
Crop 2 Harv	0.73	0.93	0.93	0.00	0.00
Crop 3 Grow	0.73	0.00	0.00	0.00	0.00
Crop 3 Harv	0.73	1.75	1.75	0.00	0.00
Crop 4 Grow	0.73	0.00	0.00	0.00	0.00
Crop 4 Harv	0.73	0.00	0.00	0.00	0.00
Crop 5 Grow	0.00	0.00	0.00	0.00	0.00
Crop 5 Harv	0.00	0.00	0.00	0.00	0.00

TOTAL OWNERSHIP COSTS					
% OF PUR PRICE	22%	20%	20%	0%	0%
TOTAL COST/YR.	2160.08	1320.05	1320.05	0.00	0.00

CROP Template - Combining Machine Costs and Entering Other Data

Once MACH and TRUCK are complete and saved, /File Retrieve CROP (or your name) again.

CROPS

Press Alt-M to see the menu. The second option in the menu, CROPS, brings up a second menu listing the five crop enterprise budgets, CROP1 through CROP5. Select CROP1. There will be a slight pause while the crop description is copied to the top of the budget. Then you should see Figure 14. 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. Use the [PgDn] or cursor keys to scroll down and see the rest of the budget.

FIGURE 14. Crop Enterprise Budget

A1:   READY

	A	B	C	D	E	F	G
1							
2					CROP 1		
3	CROP BUDGET TEMPLATE				Hay		
4			==================================				
5			UNIT	QUAN	PRICE	COST/ACRE	
6	CROP VALUE						
7	Hay		tn	3	$80.00	$240.00	
8						$0.00	
9	TOTAL VALUE					$240.00	
10							
11	ANNUAL EXPENSES						
12	GROWING						
13	Seed						
14	Alf		1b	3	$2.90	$8.70	
15	Tim		1b	1.25	$0.80	$1.00	
16	Fertilizer						
17	N		1b	7	$0.24	$1.68	
18	P		1b	35	$0.22	$7.70	
19	K		1b	57	$0.14	$7.98	
20	Lime		tn	0.5	$25.00	$12.50	

MACHINE

The MACHINE option first prompts you for "Machine Labor Hours as percent of Machine Operating Time". This allows you to add a percentage to labor hours for refueling, maintenance or other time in addition to time that the machine is actually in operation.

Next, you are prompted for the names of the files containing the machine and truck data (MACH and TRUCK or your names) as in Figure 15.

FIGURE 15. Transferring MACH and TRUCK Cost Data to CROP

READY

G149: U 2.9271100246

	D	E	F	G	H	I	J
141							
142							
143		Enter Name of File Containing Truck Cost Data					
144							
145		Enter Name of File Containing Machine Cost Data					
146							
147				Fuel	Rep&M	Time	Ownership
148		Crop 1 Grow		2.9271100246	2.147540	3.357234	39021.79
149		Crop 1 Harv		10.2280830145	9.868707	3.415940	
150		Crop 2 Grow		2.9271100246	2.147540	3.129110	
151		Crop 2 Harv		14.7343099245	18.63966	2.553211	
152		Crop 3 Grow		7.8548606699	6.629188	0	
153		Crop 3 Harv		9.1025838014	11.55746		
154		Crop 4 Grow		7.8548606699	6.629188		
155		Crop 4 Harv		8.9076333333	11.12478		
156		Crop 5 Grow		0	0		
157		Crop 5 Harv		0	0		
158							
159							
160		Machine Labor Hours as %					

PRODUCT

The PRODUCT option takes you to Figure 16, 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. Pressing Alt U will call a macro which copies the units from the crop value part of the enterprise budget into columns AP and AR.

FIGURE 16.   Total Production by Crop

AL4:

READY

	AL	AM	AN	AO	AP	AQ	AR
4							
5							
6	Crop Description			Total Quantity Produced			
7	----------		Acres	Prod. 1		Prod. 2	
8	Hay		-----	------		-------	
9	HCS		50	150 tn			
10	C Silg		150	450 bu		0	
11	HMEC		180	3060 bu		0	
12			120	636 bu		0	
13			0	0		0 tn	
14			500	0		0	
15				TO SEE UNITS Alt-U			
16							
17							
18		Farm Total					
19		----------					
20		$15,000.00					
21		$0.00					
22		$0.00					
23							

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 17). Use [PgDn] or the cursor keys to scroll down and see RETURN OVER SELECTED EXPENSES. See BASE below.

FIGURE 17. Total Value of Production and Expenses

READY

AM1: 'TOTAL ALL CROPS

	AM	AN	AO	AP	AQ	AR
1	TOTAL ALL CROPS	THIS ANALYSIS	BASE	CHANGE		
2	==================================	========	========		
3						
4	CROP VALUE	$120,000	$0	$120,000		
5	------------------------------------			--------		
6	OPERATING EXPENSES					
7	Seed	$4,850	$0	$4,850		
8	Fertilizer & Lime	14,930	0	14,930		
9	Spray & Other	9,304	0	9,304		
10	Power & Equipment	17,494	0	17,494		
11	Interest,operating	2,795	0	2,795		
12	Labor	17,854	0	17,854		
13	TOTAL OPERATING	$67,226	$0	$67,226		
14	EXPENSES					
15						
16	NET OVER ANNUAL					
17	EXPENSES	$52,774	$0	$52,774		
18						
19	OTHER EXPENSES					
20	Machine ownership	$39,022	$0	$39,022		

BASE

This option 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 (Figure 18). 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.

FIGURE 18. Combining Base Analysis for Comparison

```
AO4: (CO) U
Enter name of file to combine:                                    CMD MENU
ECONMACH   MACH       TRUCK       CROP
            AM                     AN        AO       AP         AQ      AR
1    TOTAL ALL CROPS              THIS ANALYSIS  BASE    CHANGE
2    ==================================  =======  =======
3
4    CROP VALUE                   $120,000          $120,000
5    -------------------------------------------    --------
6    OPERATING EXPENSES
7      Seed                        $4,850             $4,850
8      Fertilizer & Lime           14,930             14,930
9      Spray & Other                9,304              9,304
10     Power & Equipment           17,494             17,494
11     Interest,operating           2,795              2,795
12     Labor                       17,854             17,854
13     TOTAL OPERATING
14       EXPENSES                  $67,226            $67,226
15
16   NET OVER ANNUAL
17     EXPENSES
18                                 $52,774            $52,774
19   OTHER EXPENSES
20     Machine ownership           $39,022            $39,022
                                                          CALC
```

PRINT

This option 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 19 is a sample printout.

QUIT

This option returns you to normal mode.

FIGURE 19. Sample Printout

Crop Mgmt Decision Analysis w/ Machine Calc

NAME: Dairy Farm
LOCATION:NYS

TOTAL ALL CROPS	THIS ANALYSIS	BASE	CHANGE
CROP VALUE	$120,000	$120,000	$0
OPERATING EXPENSES			
Seed	$4,850	$4,850	$0
Fertilizer & Lime	14,930	14,930	0
Spray & Other	9,304	9,304	0
Power & Equipment	17,494	17,494	0
Interest,operating	2,795	2,795	0
Labor	17,854	17,854	0
TOTAL OPERATING EXPENSES	$67,226	$67,226	$0
NET OVER ANNUAL EXPENSES	$52,774	$52,774	$0
OTHER EXPENSES			
Machine ownership	$39,022	$39,022	$0
Land	15,000	15,000	0
Taxes	0	0	0
Miscellaneous	0	0	0
TOTAL OTHER	$54,022	$54,022	$0
TOTAL INCLUDED EXPENSES	$121,248	$121,248	$0
RETURN OVER INCLUDED EXPENSES	($1,248)	($1,248)	$0

Crop Mgmt Decision Analysis w/ Machine Calc

ACRES OF EACH CROP

Crop No.	Crop Description	Acres	Total Quantity Produced Prod. 1	Prod. 2
CROP 1	Hay	50	150 tn	0
CROP 2	HCS	150	450 tn	0
CROP 3	C Silg	180	540 tn	0
CROP 4	HMEC	120	360 tn	0
CROP 5		0	0 tn	0
TOTAL ACRES		500		

Compared to base analysis
ACRES OF EACH CROP

Crop No.	Crop Description	Acres
CROP 1	Hay	50
CROP 2	HCS	150
CROP 3	C Silg	180
CROP 4	HMEC	120
CROP 5		0
TOTAL ACRES		500

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

Item	Farm Total
Land	$15,000
Taxes	0
Miscellaneous	0

Crop Mgmt Decision Analysis w/ Machine Calc   12-Dec-86

CROP BUDGET TEMPLATE			CROP 1 Hay		50 TOTAL ACRES
	UNIT	RATE/A	PRICE/UNIT	COST/ACRE	$/CROP
CROP VALUE					
Hay	tn	3	$80.00	$240.00	$12,000.00
				0.00	0.00
TOTAL VALUE				$240.00	$12,000.00
ANNUAL OPERATING EXPENSES					
Seed					
Alf	lb	3	$2.90	$8.70	$435.00
Tim	lb	1.25	0.80	1.00	50.00
Fertilizer					
N	lb	7	0.24	1.68	84.00
P	lb	35	0.22	7.70	385.00
K	lb	57	0.14	7.98	399.00
Lime	tn	0.5	25.00	12.50	625.00
Chemicals					
Methoxychlor 2E	gl	0.75	11.88	8.91	445.50
Malathion 5E	gl	0.3	18.75	5.63	281.25
Premerge (sdg)	qt	0.33	3.25	1.07	53.63
				0.00	0.00
				0.00	0.00
				0.00	0.00
				0.00	0.00
				0.00	0.00
Power,equipment					
Fuel,oil & grease				13.16	657.76
Repair,main.				12.02	600.81
Other			3.00	3.00	150.00
Interest, operating		83.34 Rate/yr			
Months		6	12.00%	5.00	250.02
LABOR – Machine Hour		4.4	$7.00	30.55	1,527.54
Other Labor Hour		1.5	5.00	7.50	375.00
TOTAL ANNUAL OPERATING EXPENSES				$126.39	$6,319.51
NET OVER ANNUAL OPERATING EXPENSES				$113.61	$5,680.49
BREAKEVEN PRICE/UNIT FOR PRIMARY TO COVER ANNUAL OPERATING EXPENSES				$42.13	$2,106.50

Crop Management Decision Analysis

```
NAME:            _____
LOCATION:        _____
ACRES OF EACH CROP
==================
Crop No.        Crop Description              Acres
--------        ----------------              -----

CROP 1          _____      _____
CROP 2          _____      _____
CROP 3          _____      _____
CROP 4          _____      _____
CROP 5          _____      _____
   TOTAL ACRES
CHANGES IN LAND OR OTHER EXPENSES, OTHER THAN
   CROP ANNUAL EXPENSES OR MACHINERY OWNERSHIP COSTS
=====================================================
Item                          Farm Total
----                          ----------

  Land                        _____
  Taxes                       _____
  Miscellaneous               _____
```

Crop Mgmt Decision Analysis w/ Machine Calc

CROP BUDGET TEMPLATE   CROP 1
==

                        UNIT   RATE/A   PRICE/UNIT
CROP VALUE

  TOTAL VALUE

ANNUAL OPERATING EXPENSES
  Seed

  Fertilizer

  Lime
  Chemicals

  Power,equipment
    Fuel,oil & grease
    Repair,main.
  Other
 Interest, operating
   Months
 LABOR - Machine   Hour
   Other Labor   Hour

TOTAL ANNUAL OPERATING EXPENSES

NET OVER ANNUAL
   OPERATING EXPENSES

BREAKEVEN PRICE/UNIT FOR PRIMARY
   TO COVER ANNUAL OPERATING EXPENSES

INPUT VARIABLES FOR EACH TRACTOR:

Tractor #	1	2	3	4	5	6
Tractor Type	tractor	tractor	tractor	tractor	tractor	tractor
Purchase Price						
List Price						
PTO HP						
Fuel price						
Fuel,oil coef						
Repair Group #						
estim life (hrs)						
Accum. Hrs at Purc						
Years Owned						
Salvage Rate						
Annual Non-Crop Hr						
Interest Rate						
Insurance Rate						
Storage Rate						

Implement Type						
Purchase Price						
List Price						
Width in Feet						
Speed in MPH						
Field Efficiency						
Fuel Multiplier						
Repair Group #						
estim life (hrs)						
Years Old at Purchase						
Years Owned						
Salvage Rate						
# of Tractor Used						
Tractor Hrs % of Impl						

TYPE OF CROP -----> INSERT TIMES OVER FIELD BY CROP

Crop 1	Grow						
	Harv						
Crop 2	Grow						
	Harv						
Crop 3	Grow						
	Harv						
Crop 4	Grow						
	Harv						
Crop 5	Grow						
	Harv						

INPUT VARIABLES FOR EACH TRUCK

	1	2	3	4
Truck Type				
Purchase Price				
List Price				
Miles/yr				
MPG				
Fuel Price $ /gal.				
Typical Speed Miles/Hr				
Years Old at Purchase				
Years Owned				
Estimated Life (hrs)				
Salvage Rate %				
Interest Rate %				
Insurance Rate $/yr				
Storage Rate %				

ENTER RELATIVE TRUCK USE ON EACH CROP — based on acres or other cri

Crop 1 Grown				
Crop 1 Harvested				
Crop 2 Grow				
Crop 2 Harvested				
Crop 3 Grown				
Crop 3 Harvested				
Crop 4 Grown				
Crop 4 Harvested				
Crop 5 Grown				
Crop 5 Harvested				

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.

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

[2]S. 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 DIRTI-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. Ownership costs include depreciation, interest, taxes, insurance and housing.

Operating Costs

Accumulated repair costs for different types of machines at any point in their useful lives is estimated in a formula. Years owned are first multiplied by annual hours of use to give accumulated hours of use. List price of the machine is used to relate repair cost to the cost of the machine. The formula is:

$$\text{accumulated repair cost} = 0.01 \times P \times a \times \left(\frac{H \times 100}{u}\right)^b$$

> P = List price
> H = Accumulated hours of use
> u = Estimated wearout life in hours (from Table 1)
> a = Repair coefficient 1 (from Table 2)
> b = Repair coefficient 2 (from Table 2)

For used machines, repair cost over years owned is calculated by subtracting accumulated repairs at purchase from accumulated repairs at end of years owned. The repair cost over years owned is then divided by hours of use to get an average repair cost per hour. Values for Repair 1 and Repair 2 are given in Table 2 for different types of machines.

Fuel and lubrication costs depend on the nature of the job being performed, the size of the unit, and the type of fuel used. Average annual fuel consumption in gallons per hour, based on University of Nebraska tractor test data, was estimated as follows (Sprague, et al.):

> gasoline =   0.06 x maximum p.t.o.h.p.
> diesel fuel =   0.0438 x maximum p.t.o.h.p.
> L.P. gas =   0.072 x maximum p.t.o.h.p.

For individual operations, fuel consumption may vary considerably from the average. For plowing the consumption may be increased by about one-third. Costs of oil, lubricants, and oil filters approach about 15 percent of the fuel cost.

The costs of fuel, oil and lubricants per hour are calculated as follows:

> fuel and lubricants = fuel coefficient x maximum p.t.o.h.p. x
>   fuel cost x fuel multiplier

where the fuel coefficient is entered for the type of fuel used by the tractor or self-propelled power unit and the fuel multiplier is used to adjust fuel consumption up or down for a particular operation. Estimated fuel coefficients based on the Nebraska data and the 15 percent allowance for lubricants are:

```
gasoline and lubricants      0.0690
diesel fuel and lubricants  0.0504
L.P. gas and lubricants      0.0828
```

Suppose a diesel tractor is used for plowing, planting corn and raking hay. Enter a fuel coefficient of 0.0504 for the tractor. To increase fuel consumption for plowing, enter 1.33 as a fuel multiplier for the plow. Enter a fuel multiplier of 1.0 for normal fuel use in planting corn. To decrease fuel consumption for raking hay, enter a multiplier less than 1.0, such as 0.67.

Table 1. Farm Machinery Characteristics

	Speed (mph)	Field Efficiency (decimal)	Estimated Life (hours)
Moldboard or disc plow	3.5-6.0	0.70-0.90	2,500
Chisel plow	4.0-6.5	0.70-0.90	2,500
Subsoiler	3.0-5.0	0.70-0.90	
Land plane			2,500
Powered rotary tiller			
3-4 inch increment of cut	1.0-5.0	0.70-0.90	2,500
Harrow, single disc	3.0-6.0	0.70-0.90	2,500
Harrow, tandem disc	3.0-6.0	0.70-0.90	2,500
Harrow, offset or heavy tandem disc	3.0-6.0	0.70-0.90	2,500
Harrow, spring tooth	3.0-6.0	0.70-0.90	2,500
Harrow, spike tooth	3.0-6.0	0.70-0.90	2,500
Cultipacker	4.5-7.5	0.70-0.90	2,500
Rotary hoe	5.0-10	0.70-0.85	2,500
Rod weeder	4.0-6.0	0.70-0.90	2,500
Field cultivator	3.0-8.0	0.70-0.90	2,500
Field cultivator - heavy clay	3.0-8.0	0.70-0.90	2,500
Row crop cultivator	3.0-6.0	0.70-0.90	2,500
Fertilizer spreader			
Pull type	3.0-5.0	0.60-0.75	
Anhydrous ammonia applicator	3.0-6.0	0.60-0.75	
Field sprayer	3.0-5.0	0.50-0.80	
Manure spreader, beaters			2,500
Manure spreader, chain flails			2,500
Manure spreader, liquid			2,500
Corn or soybean planter, drilling seed only	3.0-6.0	0.50-0.85	1,200
Corn or soybean planter, with all attachments	3.0-6.0	0.50-0.85	1,200
No-till corn planter	3.0-5.0	0.50-0.75	1,200
Grain drill	2.5-6.0	0.65-0.85	1,000
Mower	5.0-7.0	0.75-0.85	2,500
Mower-conditioner (cutterbar)	4.0-6.0	0.60-0.85	2,000
Mower-conditioner (flail)	4.0-6.0	0.60-0.85	2,000
S.P. mower-conditioner	3.0-6.0	0.55-0.85	2,500
Rotary mower; horizontal blade	3.0-8.0	0.75-0.85	2,000
Conditioner only	5.0-7.0	0.75-0.85	2,500
Side Delivery Rake	4.0-5.0	0.70-0.85	2,500
Baler, pto	2.0-4.0	0.60-0.85	2,500

Table 1. Farm Machinery Characteristics (cont.)

	Speed (mph)	Field Efficiency (decimal)	Estimated Life (hours)
Flail type forage harvester			
in green forage	2.0-4.5	0.50-0.75	2,000
Forage harvester (pull-type)			2,000
Green forage	2.0-4.5	0.50-0.75	
Wilted forage	2.0-4.5	0.50-0.75	
Dry Hay	2.0-4.5	0.50-0.75	
Corn silage	2.0-4.5	0.50-0.85	
Recutter & wilted forage	2.0-4.5	0.50-0.75	
S.P. forage harvester			
windrower, small grain	5.0-7.0	0.75-0.85	2,000
PTO combine, wheat	2.0-4.0	0.65-0.80	2,000
S.P. combine	2.0-4.0	0.65-0.80	2,000
Corn head			2,000
Corn Picker			2,000
1-row trailed	2.0-4.0	0.60-0.80	
2-row trailed	2.0-4.0	0.60-0.80	
Beet Topper	2.0-3.0	0.60-0.80	2,000
Sugar beet harvester	3.0-5.0	0.60-0.80	2,500
Forage blower			2,000
wilted hay crop	20-30T/hr.		
corn or grass silage	20-50T/hr.		
Tractor, 2-wheel drive			12,000
Tractor, 4-wheel drive			12,000
Tractor, crawler			12,000
Truck, farm			2,000
Truck, pickup			2,000
Front end loader			2,500
Wagon and box			5,000
Wagon, feed			2,500

SOURCE: P. R. Sprague, W. A. Knoblauch, and R. A. Milligan. Profitable Combinations of Cash Crop Enterprises - Objectives and Procedures of a Sequential School Extension Program. A.E. Ext. 80-7, Department of Agricultural Economics, Cornell University, March 1980, and American Society of Agricultural Engineers, 1975. Agricultural Engineers Yearbook, pp. 347-54, St. Joseph, Michigan.

Table 2. Repair and Maintenance Cost Coefficients for Farm Machinery

Repair Group #	Machine	Repair 1	Repair 2
1	2-Wheel Drive Tractors	.120	1.5
2	4-Wheel Drive & Crawler Tractors	.100	1.5
3	Tillage Tools, Rotary How, Cutterbar, Mower, Cultivator, Cultipacker	.301	1.3
4	Fertilizer Equipment	.191	1.4
5	Self-Propelled Combine, Self-Propelled Forage Harvester, Pickup Truck, Manure Spreader, Front End Loader	.096	1.4
6	P.T.O. Baler, Corn Picker, Forage Blower, Sprayer, Pull Type Forage Harvester	.127	1.4
7	Corn Planter, Grain Drill, Mower Conditioner, Rake, Wagon	.159	1.4

SOURCE: American Society of Agricultural Engineers, 1975 Agricultural Engineers Yearbook, pp. 347-54. St. Joseph, Michigan.

Ownership Costs

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.