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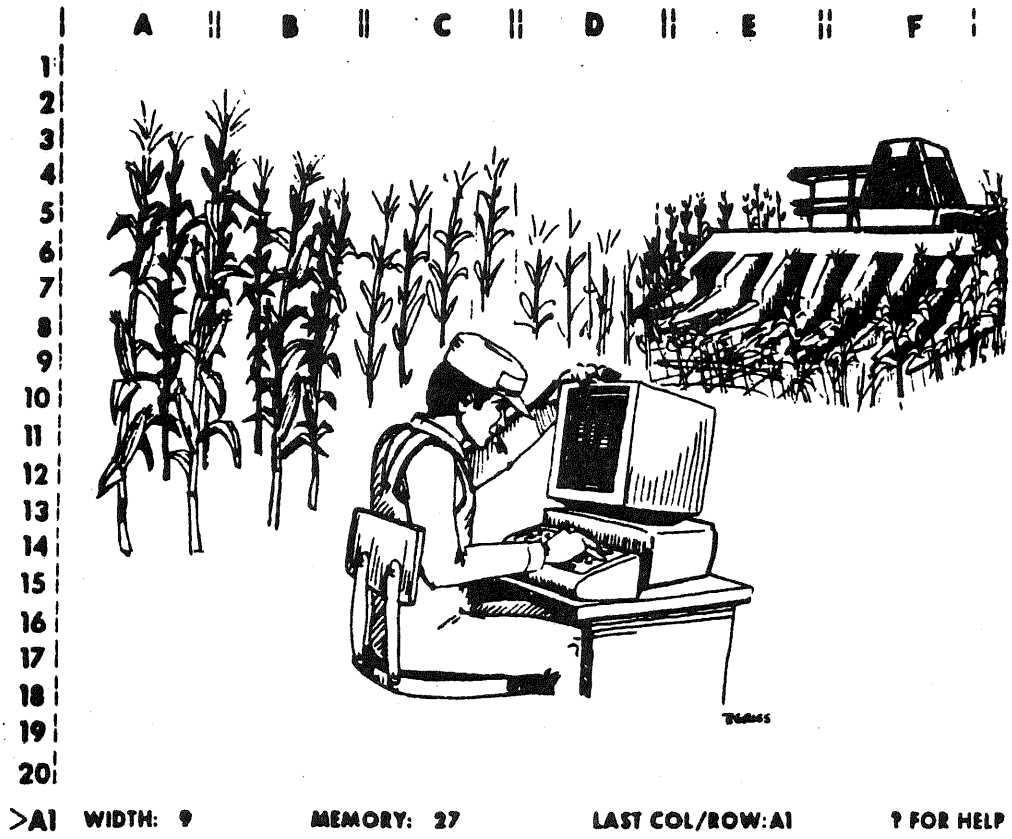
ECONOMIC PROFILE CALCULATOR FOR ELECTRONIC SPREADSHEETS

USER'S MANUAL



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INTRODUCTION

Enacted by the New York State legislature in April 1980, Chapter 79 of the Laws of 1980 altered the procedures for valuing qualified farmland in real estate tax calculations. The valuation procedure was changed by this legislation from a market base to an income capitalization approach. Stipulated in the legislation was a land classification system to be developed and administered by the New York Department of Agriculture and Markets. The State Board of Equalization and Assessment was directed to calculate land values for each soil group in the land classification system, using the income capitalization approach.

The income capitalization approach was first implemented in 1981. Economic profiles for 1975 through 1979, 1976 through 1980, 1977 through 1981, and 1978 through 1982 have been constructed for corn, hay and pasture and conveyed to the State Division of Equalization and Assessment.[1]

Agricultural land values are calculated by the State Division of Equalization and Assessment. They consider corn, hay, pasture and other crop economic profiles. Information on the procedures for determining agricultural land values has been contained in a report by the State Board of Equalization and Assessment. The latest version is in the Proposed 1984 Farmland Use Values for Agricultural Value Assessment in New York, be published early in 1984.

PURPOSE

The purpose of this bulletin is to describe a computerized procedure for calculating corn, hay and pasture economic profiles for various soil groups (currently 14 groups) using prices from different time periods. In this document, the term "economic profile" refers to the information required to determine the return to land for one high- or low-lime soil group.

The procedure uses a set of templates for the Lotus 1-2-3 electronic spreadsheet software package and an IBM XT microcomputer with 512K bytes of random-access (RAM) memory. A "template" is a microcomputer file containing a set of spreadsheet instructions to perform a specific task. The name "electronic spreadsheet" comes from the similarity to a paper spreadsheet

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[1]Knoblauch, Wayne A. and Robert A. Milligan, Economic Profiles for Corn, Hay and Pasture, A.E. Ext. 81-1, Jan. 1981; A.E. Ext. 81-23, Oct. 1981; A.E. Ext. 82-31, Oct. 1982; Knoblauch, Wayne A., William F. Lazarus and Robert A. Milligan, Economic Profiles for Corn, Hay and Pasture, A.E. Ext. 83-31, Nov. 1983; Department of Agricultural Economics, Cornell University.

[2]State Board of Equalization and Assessment, Report on the Proposed 1981 Farmland Use Values for Agricultural Assessment in New York, January 9, 1981; Report on the Proposed 1982 Farmland Use Values for Agricultural Assessment in New York, Jan. 1982; Determination of Proposed 1983 Agricultural Use Values, Dec. 1982; and Determination of Proposed 1983 Agricultural Use Values, Dec. 1983.

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 calculations are performed based on formulas stored in templates and transferred to the microcomputer's memory.

ECONOMIC PROFILE CALCULATOR TEMPLATES: OVERVIEW

There are three types of templates in the set making up the calculator. The first type contains all prices, price indices and other dated information used in the calculations for a specific period of time, for example, 1978 through 1982. The second type contains all physical quantities such as yields and crop inputs, constants and other information specific to a soil group and which does not normally change from one time period to the next. The third type contains formulas which combine this information to produce the economic profile for any desired period of time and soil group.

Templates of the first type are called "update files" and are given filenames coded to indicate that they contain prices, the most recent year included, and the number of years in the time period. For example, the file P825 contains prices for the five-year period, 1978 through 1982.

Files of the second type are called "soil files" and have filenames indicating the soil group. File SG1H contains quantities for soil group one, high-lime. Templates of the third type are "calculation files" and include:

STARTEA
MACHCOST
PRICE
ECONPROF

plus two temporary files, PRICEUP and MACHQUAN, which are created each time an economic profile is calculated. The DOS 2.0 operating system used here with the IBM XT and Lotus 1-2-3 also attaches a three-character file extension to all filenames. Lotus 1-2-3 automatically attaches the file extension. WKS attaches to all filenames without any explicit action by the user. File SG1H then appears in the DOS 2.0 directory listings as SG1H.WKS. When using Lotus 1-2-3, the user need not type the .WKS, so it is omitted here for clarity.

Macros

All of the Lotus 1-2-3 commands necessary to calculate economic profiles using the price and soil files are stored as "macros" in the templates.[3] Macros are of two types, auto-execute and manual. The auto-execute macros are what the name implies - they execute a set of commands whenever the template containing them is retrieved. The manual macros execute when the user holds down the alt key and types a or b (abbreviated as

---

[3]For more detail on macros, see the Lotus Development Corporation, Lotus 1-2-3 User's Manual Release 1A, Cambridge, MA, 1983, pp. 109-22.

alt-a or alt-b). The macros are stored in the upper right area of the template. For more detail on the macros, see the section "WHAT MAKES IT RUN: THE MACROS" of this manual.

STARTEA prompts the user for the name of a price file. This is retrieved, and then saved as PRICEUP when you type alt-a. The price file contains a prompt asking for a soil file name. After the user types this name, it is retrieved, and saved as MACHQUAN when the user types alt-a. MACHCOST is then retrieved.

MACHCOST

MACHCOST retrieves machinery names, current purchase prices, and all of the physical data needed to calculate fuel, oil, grease, repair and maintenance costs per acre and investment required per acre for corn, hay and pasture, with the allocation of investment to each crop based on each crop's proportion of each machine's annual hours of use. It prints a two-page listing of the information used to calculate machinery costs. MACHCOST is then saved and PRICE is retrieved.

PRICE

PRICE retrieves prices and price indices from PRICEUP. It calculates index factors to adjust current investment costs for machinery, machinery storage, corn silage storage and fencing to costs that would have resulted if the machinery complement had been purchased evenly over the preceding nine years, and the other items over the preceding fifteen years. PRICE also calculates machinery storage costs per acre, fencing costs per pasture acre, and corn silage costs per ton for the current year and an average for the time period. Typing alt-a saves PRICE and retrieves ECONPROF.

ECONPROF

ECONPROF retrieves information from the other files, multiplies and sums annual crop input prices and quantities to get costs per acre, calculates a weighted farmgate corn silage price, adjusts hay prices for quality, and calculates a return to land. An economic profile and a four-page listing of input information is printed as the last step in theexecution of the macro.

Time Required to Calculate an Economic Profile

Calculation of one economic profile takes approximately 12 minutes using an Epson FX-80 printer. About one-third of this time is required for printing the six-page economic profile report.

GETTING STARTED

The first-time user should begin by learning how to operate the IBM XT microcomputer with the DOS 2.0 operating system. The IBM-supplied tutorial diskette Getting to Know the XT Personal Computer is recommended as a starting point. The DOS 2.0 manual provides additional detail. Some familiarity with Lotus 1-2-3 is also recommended. The Lotus Tutorial diskette, Lessons A through D, provide an introduction to Lotus 1-2-3.

DOS 2.0 allows you to set up "directories" for use in grouping individual files stored on the hard disk or a floppy disk. When you first "boot" the IBM XT with DOS 2.0 and get a C> prompt, you are in what is called the "root" directory of the hard disk. The economic profile is set up for use with the Lotus 1-2-3 source program and STARTEA in the root directory and the remaining templates in a directory named EADIR. Some useful DOS 2.0 commands are:

MD \ EADIR	makes directory EADIR
CD \ EADIR	changes the "current" directory to EADIR
CD \	changes the "current" directory back to the root directory
TREE	displays existing directories
DIR	displays files in the "current" directory

The root directory should contain at least the Lotus 1-2-3 source program files and STARTEA (Figure 1). Figure 2 is a listing of files appearing in EADIR.

To get started, turn on the IBM XT and printer. When you see a C> prompt, insert the Lotus 1-2-3 System Diskette and type lotus <-┘. (On the IBM XT keyboard, the "return" key is labelled <-┘). Type one more keystroke, <-┘, and, after a pause, type a third keystroke, <-┘, which will give you the prompt shown in Figure 3.

Inserting the name of a price file, such as P825, should give you a look at the upper left part of that file, shown in Figure 4.[4]

Now you have a chance to check this price file to make sure it is what you want. If not, edit it or erase it and start over. But if it is okay, go to the next step by holding down the alt key and typing a. You should see the second prompt, shown in Figure 5.

When you type the name of a soil file, it will be retrieved and you will see something like Figure 6.

---

[4]If you type the wrong filename, it is easy to correct the mistake. If you haven't typed <-┘ use the backspace key to erase the wrong filename and type the right one. If you already typed <-┘ just type:

/File Retrieve

and the correct filename.

Figure 1. Partial List of Lotus and DOS Files in Root Directory Used By the Economic Profile Calculator

```
 Directory of  C:\

LOTUS      COM        481    6-07-83    1:23a
LOTUS      DLB      40889    6-07-83    1:23a
         2 File(s)    4743168 bytes free

C>dir 123.*

 Volume in drive C is FIXDISK
 Directory of  C:\

123        EXE      89856    6-07-83    1:23a
123        HLP     113416    6-07-83    1:23a
123        CNF        256    1-09-84    3:46p
         3 File(s)    4743168 bytes free

C>dir auto123.*

 Volume in drive C is FIXDISK
 Directory of  C:\

AUTO123    WKS       1536    3-05-84   10:54a
         1 File(s)    4743168 bytes free

C>
```

Figure 2. List of Files in /EADIR Directory

```
 Directory of  C:\eadir
 Volume in drive C is FIXDISK
.              <DIR>        2-27-84   11:32a
..             <DIR>        2-27-84   11:32a
ECON8      WKS     27904    3-06-84    3:13p
ECONPROF   WKS     28160    3-07-84    9:26a
MACHCOST   WKS    107136    3-16-84   10:46a
P8210      WKS     19200    3-05-84    2:32p
P825       WKS     17152    3-07-84    9:11a
PRICE      WKS      9600    3-16-84   10:46a
SG1H       WKS     15744    3-06-84    2:38p
SG1L       WKS     16256    3-06-84    2:39p
SG2H       WKS     16128    3-07-84    7:32a
SG2L       WKS     16256    3-07-84    7:32a
SG3H       WKS     15872    3-07-84    8:21a
SG3L       WKS     16000    3-07-84    8:21a
SG4H       WKS     15872    3-07-84    8:22a
SG4L       WKS     16000    3-07-84    8:22a
SG5H       WKS     15872    3-07-84    8:23a
SG5L       WKS     15872    3-07-84    8:23a
SG6H       WKS     15872    3-07-84    8:24a
SG6L       WKS     16000    3-07-84    8:24a
SG7L       WKS     15872    3-07-84    8:25a
SG8        WKS     15104    3-06-84    3:25p
C>
```

Figure 3. First Prompt of the Economic Profile Calculator

```
A1:                                                                    CMD MENU
Enter name of file to retrieve:
MACHCOST  PRICEUP   MACHQUAN  PRICE     ECONPROF  S01H      S01L      S02H
        A         B         C         D         E         F         G         H
1
2
3                        THE ECONOMIC PROFILE CALCULATOR
4
5              TYPE THE NAME OF THE UPDATE FILE TO BE USED IN THIS RUN
6
7                        A TYPICAL NAME WOULD BE:  P825
8
9                                THEN "ENTER"
10
11
12
13
14
15
16
17
18
19
20
```

Figure 4. Typical Price File, Screen Showing Upper Left Corner of the Template

```
A1: 'P825: TEMPLATE TO ENTER UPDATED PRICES FOR                          READY

      A          B          C          D          E          F          G          H
1   P825: TEMPLATE TO ENTER UPDATED PRICES FOR
2             TRANSFER TO MACHCOST AND ECONPROF TEMPLATES
3   For ECONPROF: Years          1982      1978-82  1982      1978-82
4   For MACHCOST: Tractor 1 and implements
5             Tractor Type       90 hp     Implement Type     culti-    plow
6                                tractor                      packer
7       1.24 Purchase price        28800                          1800      5670
8
9     Tractor 2 and implements
10            Tractor Type       50 hp     Implement Type     corn      culti-
11                               tractor                      planter   vator
12      1.24 Purchase price        15500                          8000      2550
13
14    Tractor 3 and implements
15            Tractor Type       35 hp     Implement Type     cultipackforage
16                               tractor                      seeder    wagon
17      1.25 Purchase price        12300                          3350     12850
18
19    Truck
20      1.25  price                          7560.00
```

Figure 5. Second Prompt of the Economic Profile Calculator

```
W1:                                                                    CMD MENU
Enter name of file to retrieve:
MACHCOST  PRICEUP   PRICE     ECONPROF  P825      SG5H      P8210     SG1H
       W        X         Y         Z        AA        AB        AC        AD
1
2
3            TYPE THE NAME OF THE FILE FOR THE SOIL GROUP DESIRED
4
5                  A TYPICAL NAME WOULD BE:  SG1H
6
7                        THEN TYPE "ENTER"
8
9
10
11
12
13
14
15
16
17
18
19
20
```

Figure 6. Typical Soil File, Screen Showing Upper Left Corner of the Template

```
A1: 'SG1H: TEMPLATE TO ENTER MACHINERY QUANTITY DATA FOR TRANSFER TO MA    READY

      A        B        C        D         E          F        G
1   SG1H: TEMPLATE TO ENTER MACHINERY QUANTITY DATA FOR TRANSFER TO MACHCOST
2
3   Tractor 1 and implements
4             Tractor Type      90 hp     Implement Type       culti-
5                               tractor                        packer
6
7             PTO HP                  90 Width in Feet             12
8   Yields                               Speed in MPH             4.5
9    Corn                                Field Efficiency         0.8
10   T/A      Fuel,oil coef      0.0504 Fuel Multiplier             0
11      18.4 Repair Group #           1                            3
12   Hay        estim life (hrs)  12000                         2500
13  T/A-cut   Years Old at Purch      0                            0
14  1.266666 Years Owned              9                            9
15         3
16        ************************************************************
17        *   Enter the acreage for each crop in column A, directly to
18        *   the left of the "grow" rows, and then enter the number
19        *   of times each implement is used per season on each crop,
20        *   either growing or harvesting, in columns G through O.
```

Make sure this is the soil file you wanted, and then type alt-a again. This file will be saved as MACHQUAN, MACHCOST will be retrieved, and prices and quantities will be added from PRICEUP and MACHQUAN. This step takes several minutes, so be patient. A two-page printout of the machinery input data comes next (Figure 7). MACHCOST is saved and PRICE is retrieved (Figure 8). Prices and price indices are added from PRICEUP, and then PRICE is saved. The program stops again at this point to let you check to see that everything is in order. If so, type alt-a again to continue. ECONPROF is retrieved next. From this point on, everything is under the control of an auto-execute macro. More data is added from the other templates, and a four-page printout gives the economic profile and supporting information (Figure 9).

The printout is organized as follows: the first page of the printout lists the crop input quantity data followed by some constants used in adjusting the hay price for quality. The second page is a listing of the input and crop prices used. The third page lists the machinery and labor costs used. The fourth page is the economic profile.

Soil Group 8

This economic profile is based on pasture rather than corn and hay, so the format of ECONPROF is not appropriate. You need to do one thing differently to substitute a file called ECON8, which contains the proper format for a pasture profile, in place of ECONPROF.

To generate a pasture economic profile, follow the same procedure as for the other soil groups. At the second prompt (Figure 5), enter SG8 as the soil file. Then, when PRICE is retrieved, type alt-b instead of alt-a. This is a macro that retrieves ECON8 instead of ECONPROF.

Figure 7. Printout of Machinery Input Data

NOTE: cultipacker is tandem-hrs not added to tractor or labor totals

INPUT VARIABLES FOR EACH MACHINE:

Fuel price	Tractor Type	90 hp tractor	Implement Type	culti-packer	plow	disc harrow	spring-t harrow	mower-condit.	baler	forage harvester	blank	blank
1.24	Purchase price	28800.00		1800.00	5670.00	4700.00	2200.00	7800.00	9200.00	14200.00	0.00	0.00
	PTO HP	90.00		12.00	5.33	12.00	16.00	9.00	18.00	6.00	0.00	0.00
Yields				4.50	4.75	4.50	4.50	5.00	2.67	2.54	0.00	0.00
Corn				0.80	0.80	0.80	0.80	0.73	0.73	0.68	0.00	0.00
T/A	Fuel,oil coef	0.0504		0.00	1.33	1.00	1.00	1.00	1.00	1.33	0.00	0.00
18.40	Repair Group #	1		3	3	3	3	7	6	6	0	0
Hay	estim life (hrs)	12000		2500	2500	2500	2000	2000	2500	2000	0	0
T/A-cut	Years Old at Purch	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.27	Years Owned	9.00		9.00	9.00	9.00	9.00	9.00	9.00	9.00	0.00	0.00
=ACRES=	INSERT TIMES OVER FIELD BY CROP											
120.00	Crop 1 Grow			1.00	1.00	2.00	1.00					
0.00	Crop 1 Harv									1.00		
30.00	Crop 2 Grow			1.00	1.00	1.00	1.00					
0.00	Crop 2 Harv							3.00	3.00			
120.00	Crop 3 Grow			0.00								
0.00	Crop 3 Harv							3.00	3.00			
30.00	Crop 4 Grow			0.10	0.10	0.10	0.10					
0.00	Crop 4 Harv											
0.00	Crop 5 Grow											
0.00	Crop 5 Harv											
300.00	total											

```
**********************************************************************
*  Enter the tractor data in cells D140 through D154 and then        *
*  enter the data for each implement starting in column F            *
*  and continuing towards the right over to column O. Data           *
*  for up to 9 implements can be entered if needed.                  *
**********************************************************************
```

NOTE: 50 hp tractor hrs.=total machine hrs -1/2 bale wagon hrs
(assumes tractor is used 1/2 as much as 1 wagon per year)
NOTE: blower hrs calculated from tons/hr-hrs/acre formula altered

INPUT VARIABLES FOR EACH MACHINE:

Fuel price	Tractor Type	50 hp tractor	Implement Type	corn planter	culti-vator	sprayer	fertil. spreader	rake	blower	bale wagon	blank	blank
1.24	Purchase price	15500.00		8000.00	2550.00	2950.00	1800.00	2250.00	2900.00	6450.00	0.00	0.00
	PTO HP	50.00		12.00	12.00	30.00	12.00	9.00	35.00	18.00	0.00	0.00
				4.50	4.50	4.50	4.00	4.50	0.00	2.67	0.00	0.00
				0.73	0.80	0.65	0.68	0.78	0.00	0.73	0.00	0.00
	Fuel,oil coef	0.0504		1.00	1.00	0.67	0.67	0.67	1.33	0.67	0.00	0.00
	Repair Group #	1		7	3	6	4	7	6	7	0	0
	estim life (hrs)	12000		1200	2500	1200	1200	2500	2000	5000	0	0
	Years Old at Purch	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Years Owned	9.00		9.00	9.00	9.00	9.00	9.00	9.00	0.00	0.00	0.00
	INSERT TIMES OVER FIELD BY CROP											
	Crop 1 Grow			1.00	0.50	1.00						
	Crop 1 Harv								1.00			
	Crop 2 Grow					2.00	1.00					
	Crop 2 Harv							3.90		3.00		
	Crop 3 Grow					1.00	1.00					
	Crop 3 Harv							3.90		3.00		
	Crop 4 Grow					0.10	1.00					
	Crop 4 Harv											
	Crop 5 Grow											
	Crop 5 Harv											

****

Figure 7. (cont.)

INPUT VARIABLES FOR EACH MACHINE:

Fuel price	Tractor Type	35 hp tractor	Implement Type	cultipacker seeder	forage wagon							
1.25	Purchase price	12300.00		3350.00	12850.00							
	PTO HP	35.00		10.00	6.00							
				4.50	2.54							
				0.68	0.68							
	Fuel,oil coef	0.069		1.00	1.00							
	Repair Group #	1		7	7							
	estim life (hrs)	12000		1200	5000	1000	2500	2000	2000	0	0	0
	Years Old at Purch	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Years Owned	9.00		9.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	INSERT TIMES OVER FIELD BY CROP											
	Crop 1 Grow											
	Crop 1 Harv				1.00							
	Crop 2 Grow			1.00								
	Crop 2 Harv											
	Crop 3 Grow											
	Crop 3 Harv											
	Crop 4 Grow			0.10								
	Crop 4 Harv											
	Crop 5 Grow											
	Crop 5 Harv											

Fuel	Purchase	truck
1.25	price	7560.00
	Miles/yr	6000.00
	MPG	15.00
	Miles/Hr	35.00
	Estim Life(hrs)	2000
	Years Old at Purchase	0.00
	Years Owned	9.00

Figure 8. PRICE Calculation File, Upper Left Corner

A1: READY

	A	B	C	D	E	F	G	H
1								
2	PRICE INDICES FOR MACHINERY AND CAPITAL IMPROVEMENTS							
3								
4	YEAR	TRACTORS	OTHER	AVG TRAC	CAPITAL	LONG-T	MACH	CORN SIL
5		& SP	MACHINES	& OTHER	IMPROV	INTEREST	STORAGE	STORAGE
6								
7	1982	163	163		135	0.1494	17600	24300
8	1981	149	149		134	0.1545		
9	1980	134	134		128	0.1303		
10	1979	120.5	120.5		118	0.1128		
11	1978	108.5	108.5		108	0.0912		
12	1977	100	100		100			
13	1976	91.5	91.5		94			
14	1975	81	81		90			
15	1974	66.5	66.5		79			
16	1973	57.5	57.5		64			
17	1972	53.5	53.5		57			
18	1971	50.5	50.5		53			
19	1970	48	48		49			
20	1969	46	46		49			

Figure 9. Printout of Economic Profile and Supporting Information

Crop Budgets

	corn				hay			
	individ crop quan/A	years applied	years rotation	rotation quantity /A	individ crop quan/A	years applied	years rotation	rotation quantity /A
SEEDS								
Corn,units	0.3125	7	7	0.3125		3	3	0
Alfalfa,lbs.					12	1	3	4
Birdsfoot trefoil,lbs.						3	3	0
Timothy,lbs.					5	1	3	1.666667
FERT & LIME								
Nitrogen,lbs.	90	7	7	90		3	3	0
Phosphorus,lbs.	60	7	7	60	47	3	3	47
Potassium,lbs.	60	7	7	60	127	3	3	127
Lime,tons						3	3	0
Custom applic.	1	7	7	1		3	3	0
CHEMICALS								
Premerge,qts.		7	7	0	1.33	1	3	0.443333
Methoxychlor,qts.		7	7	0	1	3	3	1
Atrazine,lbs.	3	2	7	0.857142		3	3	0
Atrazine,lbs.	1	5	7	0.714285		3	3	0
Crop Oil,qts.	1	2	7	0.285714		3	3	0
Sutan+ 6.7E,pts.	4.75	5	7	3.392857		3	3	0
Furadan,lbs.	10	5	7	7.142857		3	3	0
Captan/Diazanon,oz	2	7	7	2		3	3	0
TWINE					0.2839	3	3	0.2839
FUEL								
INTEREST								
MACH R&M								
MANAGEMENT CHARGE								
PRODUCTION ITEMS								
LABOR								

	Unit				
Corn J-S	bushel	56	0.89	0.1	0.91
Corn O-N	bushel	56	0.89	0.1	0.91
Soy meal	cwt	100	0.9	0.489	0.92
Hay 60%	ton	2000	0.87	0.15	0.55
mkt & trans					
drying 1/2					
grain acres					
silage price					
storage cost					
silage acres					
Protein	lbs				
Energy	Mcal				
Hay CSP	ton				
Hay	ton	2000	0.87	0.165	0.574
net grain price					
bu grain/ton silag					
wgtd unadj price					
wgtd adjustment					
wgtd adj price					

Figure 9. (cont.)

Crop Budgets

prices

	1982	1981	1980	1979	1978
SEEDS					
Corn,unit	65.00	55.00	49.00	39.50	39.00
Alfalfa,l	2.56	2.70	2.65	2.52	2.19
Birdsfoot	3.75	4.65	4.65	4.65	4.15
Timothy,l	0.85	0.80	0.80	1.35	0.70
FERT & LIME					
Nitrogen,	0.32	0.32	0.28	0.23	0.18
Phosphoru	0.28	0.28	0.28	0.22	0.19
Potassium	0.16	0.16	0.14	0.13	0.10
Lime,tons	23.80	22.50	22.80	20.40	17.80
Custom ap	5.00	5.25	5.00	4.25	3.25
CHEMICALS					
Premerge,	2.83	2.70	2.63	2.86	2.29
Methoxych	3.50	2.38	2.65	2.54	2.44
Atrazine,	3.09	3.41	2.65	2.88	3.13
Atrazine,	3.09	3.41	2.65	2.88	3.13
Crop Oil,	2.19	2.23	2.05	1.80	1.88
Sutan+ 6.	3.78	3.33	2.54	2.41	2.81
Furadan,l	0.88	1.05	0.90	0.92	0.88
Captan/Di	0.26	0.25	0.23	0.18	0.21
TWINE	24.00	23.60	24.60	15.60	13.30
FUEL	211.00	213.00	188.00	137.00	105.00
INTEREST	0.15	0.15	0.13	0.11	0.09
MACH R&M	162.50	149.00	134.00	120.50	108.50
MANAGEMEN	0.05	0.05	0.05	0.05	0.05
PRODUCTIO	149.00	148.00	138.00	125.00	108.00
LABOR	5.10	4.95	4.60	4.25	3.90

Price/Unit

	1982	1981	1980	1979	1978
Corn J-S	2.79	3.28	3.30	3.03	2.44
Corn O-N	2.42	2.56	3.30	2.57	2.07
Soy meal	14.12	15.62	13.87	13.50	11.87
Hay 60%	78.75	67.00	55.00	56.50	64.75
mkt & tra	0.14	0.14	0.13	0.12	0.10
drying 1/	0.13	0.13	0.11	0.08	0.06
grain acr	730	800	730	650	600
silage pr	22.50	22.00	21.20	21.10	19.40
storage c	3.06				
silage ac	630	600	600	625	682
Protein	0.26				
Energy	0.0333				
Hay CSP	98.94				
Hay	85.20				
net grain	2.15				
bu grain/	5.88				
wgtd unad	18.06				
wgtd adju	2.27				
wgtd adj	15.79				

Figure 9. (cont.)

FUEL COST PER ACRE	
Crop 1 Grow	7.983548
Crop 1 Harv	11.36528
Crop 2 Grow	7.500862
Crop 2 Harv	12.67354
Crop 3 Grow	1.563265
Crop 3 Harv	12.67354
Crop 4 Grow	1.960189
Crop 4 Harv	0.833333
	0.833333
	0.833333

R&M COST PER ACRE	
Crop 1 Grow	4.750520
Crop 1 Harv	7.237189
Crop 2 Grow	4.192296
Crop 2 Harv	8.575985
Crop 3 Grow	1.278212
Crop 3 Harv	8.575985
Crop 4 Grow	1.391967
Crop 4 Harv	0.589675
	0
	0

LABOR HOURS PER ACRE	
Crop 1	4.018426
Crop 2	4.859798
Crop 3	3.754645
Crop 4	0.936573
	0

=INVESTMENT BY CROP=	
Crop 1	85417.94
Crop 2	19635.08
Crop 3	45585.21
Crop 4	2191.756
	0

FUEL, R&M ADJ. FACTOR
1

MACHINERY OWN. COST INPUT DATA		
Salvage Rate	0.1	
Years Owned	9	
Insurance Rate	0.015	
	1982	1978-82
Interest Rate	0.1494	0.1276
Price Adj. Factor	0.6912	0.5620

LABOR HOURS	
6.2	Machine
7.7	Labor
7.7	Multiplier
0	0

DEPREC.	INTEREST	INSURANCE	Cur Tot
5904.14	4851.44	885.62	11641.20
1357.19	1115.20	203.58	2675.97
3150.88	2589.08	472.63	6212.59
151.50	124.48	22.72	298.70

DEPREC.	INTEREST	INSURANCE	Avg Tot
4800.17	3369.82	720.03	8890.02
1103.42	774.62	165.51	2043.56
2561.72	1798.38	384.26	4744.36
123.17	86.47	18.48	298.70

Figure 9. (cont.)

SOIL GROUP 1
7 CORN - 3 HAY
High Lime

06-Mar-84

	CORN		HAY	
	1982	1978-82	1982	1978-82
Yield (tons/acre)	18.4	18.4	3.8	3.8
Price ($/ton)	15.79	16.17	85.20	69.48
Value of Production	290.57	297.52	323.75	264.01
VARIABLE EXPENSES				
Growing				
Seed	20.31	15.47	11.66	11.60
Fertilizer				
Nitrogen	28.80	23.94	0.00	0.00
Phophorus	16.80	15.00	13.16	11.75
Potassium	9.60	8.28	20.32	17.53
Custom application	5.00	4.55	0.00	0.00
Lime	0.00	0.00	0.00	0.00
Chemicals	25.09	22.50	4.75	3.88
Power,equip				
Fuel,oil	7.98	6.46	3.54	2.87
Repair,main.	4.75	3.94	2.25	1.87
Other	1.75	1.57	2.00	1.79
Total Growing	120.09	101.71	57.68	51.28
Harvesting				
Power & Equipment				
Fuel, Oil & Grease	11.37	9.20	12.67	10.26
Repair,main.	7.24	6.01	8.58	7.12
Twine			6.81	5.74
Other	4.60	4.12	3.30	2.96
Total Harvesting	23.20	19.33	31.36	26.08
Interest on Operating Capital	10.70	7.73	6.65	4.94
Management Charge	14.53	14.88	16.19	13.20
Labor	31.62	28.27	39.27	35.11
TOTAL VARIABLE	200.14	171.92	151.15	130.61
FIXED EXPENSES				
Power,equip.	97.01	74.08	64.25	49.06
Mach. storage	6.85	5.57	6.85	5.57
TOTAL FIXED (less property tax)	103.86	79.65	71.10	54.63
TOTAL EXPENSES	304.00	251.57	222.25	185.24
RETURN TO LAND (less property tax)	-13.44	45.95	101.50	78.77
ROTATION WEIGHTED AVERAGE RETURN TO LAND,1978-82 Average		55.79		
Property Tax		8.78		
RETURN TO LAND		47.01		

UPDATING PRICES AND INDICES

The calculator can be used to update sets of five-year economic profiles, such as the one for 1978 through 1982, for other five-year time periods, such as 1979 through 1983, and to calculate profiles for other periods varying in length from one to ten years. This section describes the procedure for updating profiles for future five-year periods. The next section, starting on page 22, describes the procedure for varying the number of years in the period.

The approach for updating five-year profiles is to make a copy of the original price file, make changes in the copy, and then save the copy under a new name. To drop the oldest prices (1978), and add more recent prices (1983), use the following procedure.

1. Type /File Retrieve P825 <-┘, the price file used for the 1978 through 1982 profiles. You should see a display like Figure 4 on the screen.

2. Change the time period designation in cells D3...G3 to

   1983 1979-83 1983 1979-83

   and change the filename in A1 to P835.

3. Replace the 1982 fuel prices in A1...A20 and machinery purchase prices in cells D7-020 with 1983 prices.

4. Move the machinery and capital improvement price indices and interest rates in cells A28...F51 down one row and delete the earliest year values by combining a named range from the previous year's update file. To update P825, for example, first move the cursor to cell B29. Then type

   /File Combine Copy Named-Range UPINDEX<-┘ P825<-┘

   Then enter the 1983 data in A28...F28.

5. Replace the 1982 capital improvement prices in G28...I28 with 1983 prices.

6. Insert the year 1983 in cell A56.

7. Move the 1979 through 1982 crop input and crop prices (and corn acreages) in C73...F114 to the right one column by moving the cursor to cell D75. Then type

   /File Combine Copy Named-Range UPVAR<↵ P825<↵

   Then insert the 1983 values in column C. Table 1 is a description of the individual items and currently used sources.

8. Replace the land capitalization discount rate in A126 with the new 1979-83 value.

9. Save the updated price file under the new filename,

   /File Save P835<↵

10. One other step is necessary if you want to print out the PRICE calculation file with the new calculations of the price adjustment factors and machinery storage, corn silage storage and fencing costs. Load PRICE, and change the year designations in A46, L60...N60 and J90...O95.

11. As a final step, /File Retrieve ECONPROF and type ctrl-scroll lock to stop the autoexecute macro. Then make any changes necessary to the current-year "other growing expenses" (Z85 and AB85) and "other harvesting expenses" (Z95 and AB95) in the economic profile as well as the discount and property tax rates immediately to the left (S123 and U123). Do the same with ECON8. This completes the price update.

Printing Storage and Fencing Cost and Index Factor Calculations

The calculations in PRICE are the same for all soil groups. For that reason, PRICE is not included in the printout for each profile. PRICE should be printed each time the prices and indices are updated for a new time period. To print, run the calculator normally using the updated price file. When PRICE is retrieved, /File Retrieve Price<↵, before typing alt-a, type alt-o ("oh", not zero). When the two-page printout is complete (Figure 10), type alt-a to continue the calculations or ctrl-scroll lock to quit.

Table 1. Descriptions and Sources for Crop Input and Yield Data Items

Abbreviated Description	Description
Crop Inputs	
SEEDS	
Corn, units	Corn seed price, annual average price
Alfalfa, lbs.	Alfalfa price, annual average price
Birdsfoot trefoil, lbs.	Birdsfoot trefoil price, annual average price
Timothy, lbs.	Timothy price, annual average price
FERTILIZER & LIME	
Nitrogen, lbs.	Nitrogen fertilizer ┐ lbs. of active ingredients, price calculated from annual
Phosphorus, lbs.	Phosphorus fertilizer ├ average prices of common nutrient-supplying materials
Potassium, lbs.	Potassium fertilizer ┘ urea, triple superphosphate, muriate of potash
Lime, tons.	Ground limestone, spread on field
Custom applic.	Custom corn fertilizer application charge, per acre
CHEMICALS	
Premerge, qts.	Premerge herbicide, farm-level price
Methoxychlor, qts.	Methoxychlor insecticide, farm-level price
Atrazine, lbs.	Atrazine herbicide, farm-level price
Atrazine, lbs.	(duplicate), farm-level price
Crop Oil, qts.	Crop oil surfactant, farm-level price
Sutan & 6.7 pts.	Sutan herbicide, farm-level price
Furadan, lbs.	Furadan insecticide, farm-level price
Captan/Diazanon, oz.	Captan/Diazanon corn seed treatment
TWINE	Twine, bale, annual average price
FUEL	Most recent year prices, index of prices paid by N.Y. farmers for fuels and energy used to adjust cost per acre to multiyear average.
INTEREST	Interest rate paid on short- and intermediate-term capital
MACH R&M	Index of prices paid by N.Y. farmers for machinery and equipment
MANAGEMENT CHARGE	Management charge as a proportion of gross crop value
PRODUCTION ITEMS	Index of prices paid by N.Y. farmers for production items
LABOR	Wage rate paid by N.Y. farmers adjusted for fringe benefits
Crop Yields	
Corn J-S, bushel	Corn grain, average of June through September monthly prices
Corn O-N, bushel	Corn grain, average of October through November monthly prices
Soy meal, cwt.	44 percent soybean meal, average of June through September monthly prices
Hay 60%, ton	Hay, (alfalfa hay assumed 60% legume) average of June through September monthly prices
Mkt. & trans.	Marketing and transportation costs per bushel of corn grain
Drying 1/2	One-half of drying cost per bushel of corn grain
Grain acres	Harvested corn grain acres
Silage price	Corn silage price per ton, annual average
Storage cost	Corn silage storage cost, per ton from PRICE template
Silage acres	Harvested corn silage acres
Protein, lbs.	Crude protein price per pound (calculated)
Energy, Mcal.	Net energy (lactation) price per Megacalorie (calculated)
Hay CSP, ton	Hay price as valued based on quantities of protein and energy (calculated)
Hay, ton	Hay price normalized by reference quality hay (calculated)
net grain price	Corn grain price net of marketing, transportation and drying (calculated)
bu grain/ton silage	Bushels of corn grain yield equivalent to a ton of corn silage yield
wgtd unadj. price	Corn silage price, average of corn silage price and corn grain price converted using bu. grain/ton silage, weighted by corn silage and corn grain harvested acres (calculated)
wgtd adjustment	Adjustment for corn islage storage and corn grain marketing, transportation and transportation (calculated)
wgtd adj. price	Corn silage price minus adjustment (calculated)

Figure 10. Printout of PRICE Calculation File

PRICE INDICES FOR MACHINERY AND CAPITAL IMPROVEMENTS

YEAR	TRACTORS & SP	OTHER MACHINES	AVG TRAC & OTHER	CAPITAL IMPROV	LONG-T INTEREST	MACH STORAGE	CORN SIL STORAGE	ELEC FENCING
1982	163	163		135	0.1494	17600	24300	670
1981	149	149		134	0.1545			
1980	134	134		128	0.1303			
1979	120.5	120.5		118	0.1128			
1978	108.5	108.5		108	0.0912			
1977	100	100		100				
1976	91.5	91.5		94				
1975	81	81		90				
1974	66.5	66.5		79				
1973	57.5	57.5		64				
1972	53.5	53.5		57				
1971	50.5	50.5		53				
1970	48	48		49				
1969	46	46		49				
1968	43.5	43.5		46				
1967	41.5	41.5		44				
1966	39.5	39.5		43				
1965	38.5	38.5		42				
1964				42				
1963				42				
1962				42				
1961				42				
1960				42				
1959				42				
ADJUST FACTOR								
1982	0.69	0.69	0.69	0.64				
1981	0.62	0.62		0.60				
1980	0.55	0.55		0.55				
1979	0.50	0.50		0.51				
1978	0.45	0.45		0.47				
1973-82	0.56	0.56	0.56	0.56	0.12764			

Interest rate	0.1494	0.1276
Price adj. factor	0.6912	0.5620

Useful life, years	15
Insurance % of avg investment	0.015
Repair % of investment	0.025

Figure 10. (cont.)

TABLE 3.
INVESTMENT AND ANNUAL FIXED COSTS OF MACHINERY STORAGE
CORN SILAGE STORAGE, AND ELECTRIC FENCING

	1982 New Cost	1982 Crop Year	1973-82 Crop Years Average1
MACHINERY STORAGE			
Pole barn;three exterior walls, metal roofing, dirt floor	17600	11333.53	9795.16
Depreciation2		755.57	653.01
Interest3		846.61	625.13
Insurance4		170.00	146.93
Repairs5		283.34	244.88
Total		2055.52	1669.94
Per Acre	300	6.85	5.57
CORN SILAGE STORAGE			
Concrete stave silo; including site preparation and roof, 24' x 70'	24300	15648.00	13524.00
Depreciation2		1043.20	901.60
Interest3		1168.91	863.10
Insurance4		234.72	202.86
Total		2446.83	1967.56
Per ton	800	3.06	2.46
ELECTRIC FENCING			
Electric fencer, wire, posts, post insulators and handles	670	431.45	372.88
Depreciation2		28.76	24.86
Interest3		32.23	23.80
Total		60.99	48.66
Per Acre	30	2.03	1.62

CHANGING THE NUMBER OF YEARS INCLUDED IN THE TIME PERIOD

The purpose of averaging prices across a time period of several years is to reduce variability in capitalized land values resulting from price fluctuations in a single year. Increasing or decreasing the number of years in the average will change the year to year variability and the level of capitalized land values that result.

The PRICE and ECONPROF templates will accommodate time periods of from one to ten years with no modification, by making minor changes in the update file used. To increase the number of years, follow the following procedure:

1. /File Retrieve P825 or other update file to be used as the original.

2. Change time period designation in cells D3...G3.

3. Add the annual crop input and crop prices and corn acreages to the right (or left) of the existing prices in H73...L114. Use the /Move and /Copy command to move existing data to the right or left as needed. Any prices which appear in columns C through L will be averaged. The built-in function @avg (range) used to calculate averages ignores any blanks in the range, so will adjust automatically to extra columns of price data in columns H through L.

4. Add machinery and capital improvement price indices for the additional years. Currently, a nine-year life is assumed for machinery, so price indices must be included for eight years previous to the earliest year included in the time period. Price indices for capital improvements must be included for 14 previous years (a 15-year life is assumed).

5. Use the /Copy command to make additional copies of cells A56...E60 for the additional years in the time period, or delete cells if reducing the number of years.

6. Replace the updated update file under a new filename. To reduce the number of years, simply use /Range Erase to erase the unneeded prices in C73...F114 and erase the unneeded averages in A56...E60. The extra price indices in A28...F51 can be but do not have to be erased.

CHANGING CROP INPUT QUANTITIES

Crop input quantity data is entered for each soil group in a file with a name beginning with "SG", such as SG1H. The number following the SG indicates the soil group, followed by an "H" or "L" for high- or low-lime. Crop input quantities are entered in cells C115...I135. Corn inputs are entered in columns C through E, with hay in columns G through I.

Corn quantity data is entered as a quantity per acre per year, followed in the next column by the number of years out of the 10-year rotation that the input is applied. The next column is the number of years that corn is grown in the rotation. Then, the quantity is averaged over all years corn is grown to give a "rotation quantity per acre", in the next column (Figure 9). The same approach is used for hay. For soil group eight (file SG8), pasture input quantities are entered in place of corn. Table 1 describes the crop input and yield data items.

MACHINERY INPUT DATA AND COST CALCULATIONS

The physical input data for machinery ownership and operating cost calculations is stored in cells A3...0106 of each soil file. The machinery purchase prices and fuel prices are stored in cells A7...020 of the update files. The next section describes the method used to calculate machinery costs and the input data needed.

Method Used to Calculate Machinery Costs

Machinery ownership and operating costs and hours of machine operating labor per acre are calculated using engineering formulas for 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 for one operation 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 2.

Table 2. 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
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	1,200
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 2. Farm Machinery Characteristics (cont.)

	Speed (mph)	Field Efficiency (decimal)	Estimated Life (hours)
Flail type forage harvester			
in green forage	2-4.5	0.50-0.75	2,000
Forage harvester (pull-type)			2,000
Green forage	2-4.5	0.50-0.75	
Wilted forage	2-4.5	0.50-0.75	
Dry Hay	2-4.5	0.50-0.75	
Corn silage	2-4.5	0.50-0.85	
Recutter & wilted forage	2-4.5	0.50-0.75	
S.P. forage harvester			
windrower, small grain	5-7	0.75-0.85	2,000
PTO combine, wheat	2-4	0.65-0.80	2,000
S.P. Combine	2-4	0.65-0.80	2,000
Corn head			2,000
Corn Picker			2,000
1-row trailed	2-4	0.60-0.80	
2-row trailed	2-4	0.60-0.80	
Beet Topper	2-3	0.60-0.80	2,000
Sugar beet harvester	3-5	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. Extension 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.

MACHINERY 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 tse 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 2)
a = Repair coefficient 1 (from Table 3)
b = Repair coefficient 2 (from Table 3)

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 3 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

Table 3. 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 Hoe, 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.

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.

Many of the calculations for estimating truck operating costs are the same as those used for figuring machinery costs. Hours of use and fuel usage are different in that these costs are based on miles driven per year, typical speed in miles per hour and the average rating of miles per gallon. Truck ownership expenses are allocated among various crops based on crop acreage. Fuel cost, repair and maintenance expense and labor are divided equally among crops and between growing and harvesting periods.

The following formulas are used for these items:

$$\text{hours per acre} = \frac{\text{miles per year}}{\text{miles per hour x acres}}$$

$$\text{fuel cost per acre} = \frac{\text{miles per year x fuel price}}{\text{miles per gallon x acres}}$$

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 for 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 each 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.

MACHINERY INPUT DATA

The machinery complement assumed in the 1978 through 1982 economic profiles will be used as an example to illustrate the way machinery input data is organized. This machinery complement includes 3 tractors, 16 implements and a pickup truck. Each of the implements is assumed to be used with one of the three tractors.

Refer back to Figure 7. All data for a single tractor or implement is grouped in a single column. Implements used with the first tractor are

listed in the columns to the right of that tractor. Implements used with the other tractors are listed to the right of those tractors.

The reason for grouping implements with the tractors used with each implement is simple - annual hours of use is calculated for each tractor by summing annual hours of use for the implements. This annual hourly use figure is very important. It is used in the repair cost calculations and also used in allocating ownership costs to corn, hay and pasture for each machine.

Column A in Figure 7 contains a price per gallon for the fuel used with the tractor, followed by crop yields per acre. The corn silage yield is entered as tons per acre. The hay yield is entered as tons per acre per cutting, followed by the number of cuttings per year. Next are the acreages of each crop. Notice that the hay seeding year is separated from later years of the stand.

WHAT MAKES IT RUN: THE MACROS

The macros that do the file retrieving, saving and combining as well as printing are located in the upper right area of each template. Comment statements to the right of each macro describe its function.

The auto-execute macros that execute every time the template containing them is retrieved are given /Range Names of \0 (zero).[5] Macros named \a restart the calculations at four points. Substitute the macro \b for \a in PRICE when doing an economic profile for soil group 8. These macros call other macros (similar to subroutines) that actually do the work in MACHCOST and ECONPROF. In each of these two templates, a macro named \p (for prices) retrieves price and price index data, a macro named \t (for transfer) retrieves quantities, and \o ("oh" for output) does the printing.

The macros \p, \t and \o can be executed individually by typing alt-p, alt-t and alt-o, respectively. You will get an error message at the end of execution, but ignore it. Use the esc key to continue. The macros contained in files STARTEA, P825, SG1H, MACHCOST, PRICE and ECONPROF are listed in Figure 11.

---

[5]To override an auto-execute macro, /File Retrieve the template and immediately hold down ctrl and type scroll-lock.

Figure 11. Listing of Macros Contained in Economic Profile Calculator Templates, By File Name

AUTO123

```
MACRO O
/fdeadir~           Change file directory from "root" to \eadir
/fr{?}~             Prompt user for update file name
```

P825

```
MACRO A
/fspriceup~r~       Save this file as PRICEUP
{goto}w1~
/fr{?}~             Prompt user for name of
                    soil file
```

SG1H

```
MACRO A
/fsmachquan~r~      Save this file as MACHQUAN
/real.o169~
/frmachcost~        Retrieve MACHCOST
```

Figure 11 (cont.)

MACHCOST

```
MACRO O
/xc\p^              Call macros \p (prices),
/xc\t^              \t (quantities)
/xc\o^              and \o (print output)
/fsmachcost^r^      Save this file as MACHCOST
/xg\a^              Call macro \a

MACRO A
/frprice^           Retrieve PRICE


MACRO P
{goto}a16^                      Combine machine prices
/fccnprice1^priceup^            from PRICEUP
{goto}a127^
/fccnprice2^priceup^
{goto}a237^
/fccnprice3^priceup^
{goto}a340^
/fccnprice4^priceup^
{calc}
/xr


MACRO T
{goto}a21^                      Combine quantities and constants
/rua34.a43^                     from MACHQUAN
/fccncrop^machquan^
{goto}d14^
/red17.o43^
/fcanquan1^machquan^
{goto}d125^
/red128.o154^
/fcanquan2^machquan^
{goto}d235^
/red238.o265^
/fcanquan3^machquan^
{goto}e341^
/fccnquan4^machquan^
{calc}
/xr



MACRO O
/pprout11^g         Print machine input data
rout12^g
rout21^g
rout22^gp
rout31^g
rout32^g
rout4^gpq
/xr
```

Figure 11 (cont.)

PRICE

```
MACRO O
/xc\p^                  Call macro \p
/fsprice^r^             Save this file as PRICE


MACRO P
{goto}a7^
/rea7.i45^                      Erase old price indices and
/fccnpricecap^priceup^          load new ones from PRICEUP
/xr


MACRO A
/freconprof^            Retrieve ECONPROF

MACRO B
/frecon8^               Retrieve ECON8

MACRO O
/pprout1^gp                     Print price indices and
rout2^gpq                       capital improvement costs
/xr
```

ECONPROF

```
MACRO O
/xc\p^    Call macro \p
/xc\t^    Call macro \t
/xc\o^    Call macro \o


MACRO T
{goto}C7^                       Retrieve quantities
/rec7.j50^                      from MACHQUAN
/fcancrin^machquan^
{goto}q77^
/fccnhrs^machquan^
{goto}m74^
/rem74^
/fcanadj^machquan^
{goto}o78^
/reo78.o80^
/fcanown^machquan^
{goto}a62^
/rua62.a71^
/fccnacres^machquan^
{goto}z58^
/fccntitle^machquan^
{goto}a73^
/fccnyields^machquan^
{calc}^
/xr
```

Figure 11 (cont.)

ECONPROF (cont.)

```
MACRO O
{calc}~                                  Print output
/pprout1~gp
rout2~obca1.a55~qgp
cbrout3~gpq
/ppos{esc}\018\0270~p88~q                Compress line height for
rout4~gp                                 economic profile
os{esc}\015\0272~p66~qq                  Reset line height

MACRO P
{goto}15~                                Retrieve prices from PRICEUP
/re15.u46~                               and combine machinery costs
/fccnpricin~priceup~                     from MACHCOST and price
{goto}s123~                              index adjustment factors
/res123~                                 and storage costs from PRICE
/fccndisc~priceup~
{goto}h61~
/reh61.h97~
/fcanexpense~machcost~
{goto}z110~
/rez110~
/fcanstor1~price~
{goto}aa110~
/reaa110~
/fcanstor5~price~
{goto}145~
/re145~
/fcansi11~price~
{goto}w45~
/rew45~
/fcansi15~price~
{goto}o82~
/reo82.p83~
/fcanin~price~
{goto}z64~
/fccnyear~priceup~
/caa64~x121~
{calc}
/xr
```

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