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**ANALYZING  
REPLACEMENT EQUIPMENT  
PURCHASES**

**By**

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## ABSTRACT

This paper provides a guide for the use of a computer template to aid in analyzing the economic feasibility of major farm equipment replacement decisions. The template uses the Lotus 1-2-3 spreadsheet Version 2 or 2.01 program with an IBM or compatible computer. A worksheet and explanations are provided to accumulate the needed data and assumptions to expedite data entry. Step by step instructions help the user in the use of the template and suggestions are offered to help interpret the results. A copy of the template on a 5¼ inch diskette may be obtained from either author at cost.

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ANALYZING REPLACEMENT EQUIPMENT PURCHASES  
Darwin P. Snyder and Wayne A. Knoblauch<sup>1</sup>

INTRODUCTION

Farm machinery is an important part of the farm business operation - important for getting work done on time and important as a cost of doing business. When machinery is purchased, large sums are committed to assets, some of which may be used only a few days a year. This is especially true of some growing and harvesting equipment. Making an effort to objectively analyze such purchases can be an important step in the process of controlling equipment costs.

The investment in farm machinery is nearly 20 percent of total assets on dairy farms in New York State.<sup>2</sup> Operating costs of machinery repairs, fuel, and lubrication account for about 10 percent of annual operating expenses. Total ownership and operating expenses for machinery on New York dairy farms are 19 percent of total expenses; \$132 per tillable acre and \$2.46 per hundredweight of milk sold.

In recent years, dairy farmers have been reducing capital expenditures for machinery - influenced, no doubt, by lower milk prices. The New York Dairy Farm Business Summary shows a steady decline in capital machinery purchases since 1979. In 1986, outlays for machinery averaged \$136 per cow compared to \$227 per cow in 1979 - a 40 percent decrease and the lowest since 1975. The aging of equipment on New York farms will require continuing operators at some point to recapitalize their farm machinery inventories, use custom operators to a greater extent or purchase more of their feed supply.

This report describes the use of a spreadsheet template designed to analyze the economics of farm equipment purchase decisions. It is sufficiently flexible to deal with most circumstances. Provision is made for initial purchase or trade-in, various amounts of debt financing, the changes in tax law as a result of the 1986 Tax Reform Act, and changes in cash flow resulting from the purchase.

The analysis of purchasing replacement equipment is accomplished in this template by using the technique called discounted cash flow analysis. This technique is based on the idea that a dollar in hand today is worth more than one in the future. To be economically sound, a capital purchase decision should result in a positive net present value. That is, over the period the item will be used, the inflows resulting from the decision should exceed the outflows. These results recognize the effects of income taxes, inflation, interest rates, and the timing and size of the inflows and outflows. Present value analysis, recognizing the time value of money in these ways, provides an effective method to estimate whether or not the purchase decision is economically sound over the planning period.

"Spreadsheet template" is a term used for a type of computer program developed by specifying the calculations to be performed using commercially distributed software. The software allows the user access to a grid of rows and columns in which data can be entered and math operations performed on the

<sup>1</sup>Research Associate and Associate Professor, respectively, at Cornell University.

<sup>2</sup>Smith, S.F., Knoblauch, W.A., and Putnam, L.D., Dairy Farm Business Summary, New York, 1986, A.E. Res. 87-20, Department of Agricultural Economics, Cornell University, July 1987.

data. The resulting worksheet is analogous to filling out a form with a pencil but without having to do the mathematical calculations.

The availability of personal computers and appropriate programs has made calculations of this nature easier and more likely to be done. Once the program is designed and proven operational, complex calculations are made consistently and easily and use can become quite routine. However, meaningful use and results depend on the integrity of the program and the data supplied by the user.

### Using The Template

Use of this decision aid need not be restricted to those who have a personal computer of their own. County Extension agents can provide help by using their office computer and expertise to key in data for a given set of data provided by the farm manager.

The program is available on a 5¼" diskette and requires the following computer hardware and software:

1. An IBM compatible computer with at least 256K of internal memory.
2. A Lotus 1-2-3 spreadsheet program, Version 2.01 (the template is written in Version 2.01).
3. An 80 column printer for hard (paper) copies. The template includes a PRINT macro (part of the program) that controls character size and works with an Okidata 93 Microline printer. If the template does not respond to the "print" command, check the PRINT macro and your printer's setup codes for compatibility. See Appendix II.
4. Diskettes of the original program and a backup of the template.

A diskette containing the template (EQPUR881) can be obtained through your county Extension agent or either author at the Department of Agricultural Economics, Cornell University, Ithaca, New York 14853-7801. A nominal fee may be charged to cover the diskette, duplicating, and mailing costs.

In using this or any program, it would be prudent for you to carefully check the results for reasonableness. Program results need to be compared with your (or someone's) perception of what might be expected. Here is where experience and judgment can help avoid the use of poor data and/or inaccurate results.

The template has been designed, tested, and reviewed as presented. The authors believe the procedures and calculations, when properly used, will lead to reliable results. The user, however, assumes full responsibility for the data required, use of the template, and interpretation and application of the results.

### Making a Backup Copy

Upon receipt of a disk containing the EQPUR881 template, a backup copy (the working copy) should be made. Thus, if you damage the working copy, a new backup copy of the template can again be created from the original copy.

To make a backup copy using a single drive hard disk computer with MS-DOS:

1. Start with the system prompt on the screen, C>.
2. Type DISKCOPY and press RETURN.
3. Follow the directions on the screen.
4. After the contents of the "source" (original) disk have been copied to the "target" (backup) disk, press N if you have no other disks to copy.
5. You have completed preparation of a backup of your original template. Store the original EQPUR881 disk in a safe place and label the backup disk "EQPUR881.WK1 working copy" with the current date.
6. Use the backup copy as your working copy.

To make a backup copy using a computer with two disk drives with MS-DOS:

1. Load MS-DOS to get the system prompt on the screen, A>.
2. Insert the source disk (to be copied) in drive A, and the target disk in drive B.
3. After the A> prompt, type: COPY A: EQPUR881.WK1 B: and press RETURN.
4. The file EQPUR881.WK1 will be added to the files (if any) already on the target disk for use as a working or backup copy. Label the source disk and keep in a safe place in case another working copy is needed.

#### USING EQPUR881

Input Data Required - Use of the EQPUR881 template requires the user to supply data and make assumptions applicable to his or her own unique circumstances. Results of the analysis are dependent upon the accuracy of the data inputs. The results will obviously be affected if, over the course of future years, the assumptions used prove to be inaccurate.

Appendix IV provides a worksheet to accumulate data and assumptions required by the template. Once assembled, these items can be quickly keyed into the program as the user progresses through the menu of the template. Use of the Data Entry Worksheet will minimize the amount of computer use time. These forms may be copied for appropriate use with the EQPUR881 template.

Layout of The EQPUR881 Template - A schematic diagram of the template is shown in Appendix I. This diagram shows the relative locations of the various parts of the template used for data input, macros and calculations. The user should have no need to access the template except for data entry as explained in the next section.

To Enter Data - Once the required data has been entered on the Data Entry Worksheet, the following steps will lead to the point of entering data into the template to obtain the results of the assumptions chosen.

1. Boot up Lotus 1-2-3, Version 2.01 (or Version 2).
2. Insert your disk containing the EQPUR881 file in drive A.

3. Press /FR (slash, File, Retrieve).  
Hard disk users: If drive C file names appear, press the *ESC* key until the first line appears as: "Name of file to retrieve:". Then enter A: and press *RETURN*.
4. Press the right arrow key to move the pointer to the file named EQPUR881.WK1.
5. Press *RETURN* (to retrieve the file).
6. The title screen will appear as shown in Figure 1.

Figure 1. Title Screen for EQPUR881 Template

A1: [W19] 'EQPUR881.WK1

```

1      A                      B                      C                      D
2      EQPUR881.WK1                      Last Revised:      Feb 15, 1988
3      v88.1                      FARM MACHINERY ECONOMICS
4
5      Capital Budgeting Analysis of Replacement Equipment Purchase
6
7      Developed by Wayne A. Knoblauch, Programmed by D.P.Snyder & P.L.Eddie
8                      Department of Agricultural Economics
9      New York State College of Agriculture and Life Sciences
10                      Cornell University
11
12     Purpose:
13     To aid in making capital purchase decisions using individual data
14     and present value analysis. A positive Net Present Value indicates
15     the purchase will enhance income assuming assumptions are valid for
16     the planning period. See printed instructions for help.
17
18
19     TO ENTER DATA:      Press ALT M to invoke the main menu.
20     -----
15-Apr-88  10:03 AM

```

The template is menu driven through a series of commands that will appear at the top of the screen. This menu is based on Lotus 1-2-3 macros which aid in data entry.

The title screen includes one simple step to begin the data entry process. This involves holding the "ALT" key down while you press the "M" key. This will call up the main menu which will appear at the top of the screen as:

```
NAME/RATES/LOAN  YEARS  OUTFLOW  INFLOW  PRINT  SAVE/QUIT  QUIT
```

Each of the first four commands should be used to enter data into the template in sequence from left to right. To speed up data entry, calculations are not made as data is entered. Rather, calculations are



made only once after data has been entered in the INFLOW section. As the pointer stops on each command, the line below explains the function of the command. The PRINT command is used to print the results after all data has been entered. The SAVE/QUIT command can be used to recalculate then save the current data to the EQPUR881 file replacing existing data. It will also return to the Lotus "Ready" mode leaving the menu control. The QUIT command can be used at any time to leave the "menu" mode and return to the Lotus "Ready" mode. The QUIT command will recalculate any data entered without saving it.

Caution - After pressing *ALT M* you will be in the menu or command mode (CMD appears at the bottom of the screen). The main menu may be called up at any time by pressing *RETURN*. Use *ALT M* only when "CMD" does not appear at the bottom of the screen.

To continue past the title screen:

7. Press *ALT M*. While in the menu mode, pointer movement is restricted to the unprotected cells for data entry.
8. With the pointer on NAME/RATES/LOAN, press *RETURN* (see Figure 2).
  - The pointer will move to the first data entry location, cell B22 in Figure 2. Use the down arrow key to move to the data entry locations which follow the sequence of data you have accumulated on the Data Entry Worksheet in Appendix IV, Items 1 through 13.
  - When the pointer returns to the first data entry location, press *RETURN* to return to the main menu. Do not press *ALT M*.

We will follow Dan Farmer through his use of the program to evaluate a new equipment purchase. The values used in Dan's analysis are simply for illustration purposes, they are not recommended values.

The planning period for comparison of results of the equipment replacement decision should be at least as long as the term of financing or the cost recovery period, whichever is longer. This will allow the full effects of the financing and depreciation to be reflected in the net present value. In this example, a planning period of 10 years is assumed.

Figure 2. Name/Rates/Loan Screen (Circled cells are for data input.)

B22: U 'Dan Farmer

	A	B	C	D
21				
22	Name:	Dan Farmer		
23	Machine:	Self Propelled Combine		
24				
25	Month:	1	Loan:	\$30,000
26	Day:	26	Rate:	11.50%
27	Year:	88	Term, yr:	6.0
28			Pmt: 1=Ann, 2=Mon>	1
29			Annual Payment:	\$7,193.74
30			First pmt: 1=yr 1, 2=yr 2>	1
31				
32	Data to Calculate Discount Rate:			
33	NOMINAL WACC:	10.00%	REAL AFTER TAX	
34	MARGINAL TAX RATE:	20.00%	DISCOUNT RATE:	4.85%
35	INFLATION RATE:	3.00%	NOMINAL AFTER TAX	
36			DISCOUNT RATE:	8.00%
37	Sec 179 Election:	\$10,000		
38				
39	Eqpt sold &/or traded			
40	Depr yrs left:	2.5		
	15-Apr-88 10:04 AM		CMD	

In our example, Dan Farmer is considering the purchase of a self-propelled combine. He wants to know if he should repair the old machine or purchase a new combine. He estimates the weighted average cost of his debt and equity capital over the life of this machine will be about 10 percent. (See note for Item 4 in Appendix IV, Data Entry Worksheet.) Also, the best estimate of his marginal income tax rate totals 20 percent for Federal and State taxes. He feels that inflation will average three percent over the 10 year planning period. These factors will provide necessary information for the program to calculate the discount rates used in various parts of the program.

Two discount rates are used in the analysis. The real after tax discount rate is calculated by the program to be 4.85 percent. It is used to calculate the present value of items where the amount before tax will change over time as it is affected by inflation. These items include outflows or inflows which are expected to occur each year the machine is owned. On the other hand, some items represent flows of fixed amounts that are not affected by inflation. A nominal after tax discount rate of 8.0 percent is calculated for these items which include the initial payment, debt service, sale proceeds, tax credits, and cost recovery flows.

After entering the rates necessary to calculate the discount rates, space is provided to enter a portion of the investment, currently up to

\$10,000, to be expensed the first year, rather than depreciated, under IRS Code Section 179. In the example shown in Figure 2, the full \$10,000 is entered.

The purchase of the combine involves the disposition of the old combine which may have a book value not yet recovered through depreciation. The next data entry cell is provided to enter the remaining years of depreciation for the old combine. In this example, Dan has two and one half years of depreciation left on his current combine. This entry will cause the remaining depreciation on the old combine to be netted out of the annual depreciation of the new combine over the first three years using straight line depreciation. These adjustments occur in the depreciation amounts before tax in the inflow section shown in Figures 5 and 6.

To finance the purchase of the combine, Dan plans to borrow \$30,000. Interest on the loan will be 11.5 percent and the debt will be repaid annually over six years with payments to start at the end of the purchase year. If the combine was purchased with no payment due until the following spring or the next year, "2" should be entered to indicate payment starts in year 2.

When all data for this screen has been entered, press the down arrow again and the pointer will return to the first data entry location. Press *RETURN* to return to the main menu. Do not press ALT M.

9. Press the right arrow key once to move the pointer to YEARS and press *RETURN*. The main menu will change as shown in Figure 3. The rest of the screen will remain unchanged.
  - Move the pointer to the appropriate depreciation period (see Item 14 on the Data Entry Worksheet).
  - Press *RETURN*. The screen will flutter as the program responds to your command and returns to the main menu.

Note - The choice of five or seven years implies the use of rapid depreciation under the Modified Accelerated Cost Recovery System. It does not provide for use of straight line depreciation under alternative MACRS.

Figure 3. Years Screen

```

A21: [W19]
5 YEARS  7 YEARS  RETURN
Cost Recovery Class

      A              B              C              D
21
22      Name: Dan Farmer
23      Machine: Self Propelled Combine
24
25      Month:      1              Loan:      $30,000
26      Day:      26              Rate:      11.50%
27      Year:      88              Term, yr:      6.0
28                                  Pmt: 1=Ann,2=Mon>      1
29                                  Annual Payment:      $7,193.74
30                                  First pmt: 1=yr 1, 2=yr 2>      1
31
32 Data to Calculate Discount Rate:
33      NOMINAL WACC:      10.00%  REAL AFTER TAX
34      MARGINAL TAX RATE:      20.00%  DISCOUNT RATE:      4.85%
35      INFLATION RATE:      3.00%  NOMINAL AFTER TAX
36                                  DISCOUNT RATE:      8.00%
37      Sec 179 Election:      $10,000
38
39      Eqpt sold &/or traded
40      Depr yrs left:      2.5
15-Apr-88  10:05 AM              CMD

```

The nature of the equipment purchased will determine the depreciation period chosen. In this example, the combine, as a piece of farm equipment, must be depreciated over seven years when rapid depreciation is chosen. It is also assumed that the half year convention is used since less than 40 percent of Dan's capital purchases this year were made in the fourth quarter.

10. Press the right arrow key twice to point to OUTFLOW and press *RETURN* (see Figure 4). Figure 4 shows more than one screen to help in our discussion.

-- The pointer will move to the first data entry location. Use the right arrow key to move to the data entry locations which follow the sequence of data you have accumulated on the Data Entry Worksheet in Appendix IV, Items 15 through 20.

Figure 4. Outflows Screen(s) (Circled cells are for data input.)

Item	Amount Before Tax	Amount Of/ After Tax	Timing year Start	Timing year End	Present Value Factor	Present Value
<b>OUTFLOWS</b>	\$	\$				\$
Eqpt price less trade-in value	40,000					
Unrecovered cost on trade-in	10,000					
Down payment at time of sale	10,000			0	1.0000	10,000
Amount financed	30,000					
Prin & Int :						
Year 1	7,193.74	6,504	1		0.9259	6,022
2	7,193.74	6,590	2		0.8573	5,650
3	7,193.74	6,686	3		0.7938	5,307
4	7,193.74	6,793	4		0.7350	4,993
5	7,193.74	6,912	5		0.6806	4,704
6	7,193.71	7,045	6		0.6302	4,440
7	0.00	0	7		0.0000	0
8	0.00	0	8		0.0000	0
9	0.00	0	9		0.0000	0
10	0.00	0	10		0.0000	0
11	0.00	0	11		0.0000	0
(Cash rec'd) : sale of old eqpt	(4,000)				1.0000	(4,000)
Taxable gain (loss) on eqpt sale	1,000	200	1		0.9259	185
ITC recapture on disposition		500	1		0.9259	463
Incr costs or decr returns /yr	100	80	1	10	7.7766	622
<b>NET OUTFLOWS</b>						<b>(2) \$38,387</b>

The following notes, referenced in Figure 4, will help explain the various parts of the OUTFLOW items. This section calculates the present value of disbursements that are expected to result from the combine purchase. Since Figure 4 shows more than one screen, you may want to use the right and left arrow keys to follow our discussion below.

- The equipment price less trade-in value (the boot price) of the combine is \$40,000.
- The unrecovered (undepreciated value) of the trade-in is \$10,000.
- The \$10,000 down payment is calculated by the program as the difference between the boot price and the amount financed. Since the down payment is disbursed when the sale is closed, the present value factor is one. That means the present value (or cost) of that disbursement is equal to the disbursement because the cost occurred now rather than at some time in the future.
- The next line shows the amount financed as \$30,000. This amount was entered in the screen shown in Figure 2 and carried forward to this location. Space is allowed for this loan to be repaid over a maximum of 10 years beginning in either the purchase year or the second year. Since this loan has a term of six years, six annual payments are listed beginning in the purchase year (the first payment was made in Year 1 as entered in the NAME/RATES/LOAN screen; see Figure 2).

Using Year 1 as an example, \$7,193.74 is the annual payment and includes both principal and interest actually disbursed. The interest portion of the annual payment is a deductible business expense. With a 20 percent marginal tax rate, the actual net disbursement amounts to \$6,504 after taxes.

The next column shows that this net cost occurs at the end of Year 1. Since Dan has the use of \$6,504 for one year (from the purchase date to the due date of the annual payment), he receives the benefit of the 8.0 percent nominal discount rate. Therefore, considering the interest deduction, tax rate, discount rate, and the time interval, the \$7,193.74 loan payment at the end of Year 1 has a present value (or cost) of only \$6,022.

- e. The next "outflow" item is actually \$4,000 received from the sale of a corn head not traded in with the combine. This entry must be negative because it is income in the OUTFLOW section. Because this sale would occur about the same time as the new purchase, it has a present value equal to the \$4,000 cash received.
  - f. The sale of the corn head resulted in a gain of \$1,000 over its depreciated or book value. Since the gain is taxed at 20 percent at the end of Year 1, the \$200 tax cost then results in a present value of \$185 using the 8.0 percent nominal discount rate.
  - g. Because the old combine will be disposed of before the end of the Investment Tax Credit recovery period, \$500 of the original tax credit taken will be recaptured at the end of the current tax year (assumed to be the end of Year 1). This additional tax or cost results in a present value of \$463.
  - h. The last item in the OUTFLOW section provides a place to enter any other additional costs or decreased returns that may result from the proposed purchase. In this case, Dan estimated an extra cost of \$100 each year because the new combine would be air conditioned whereas the old one wasn't. Since this cost will occur annually over the 10 years Dan expects to own the machine, "1" is entered in the "Timing Year-Start" column and "10" is entered in the "Timing Year-End" column. (The 10 year ownership period was recorded on the Data Entry Worksheet, in Appendix IV, Item 21.) The present value factor for this annual cost is the sum of factors for 10 years. The present value of \$622 is the sum of the 10 annual present values for this cost. The total present value of the OUTFLOWS resulting from the purchase of this combine is \$38,387 over the 10 year planning period.
- Press the right arrow key again and the pointer will move to the first data entry location. Press *RETURN* to return to the menu.
11. Press the right arrow key three times to point to INFLOW and press *RETURN* (see Figure 5).
- The pointer will move to the first data entry location. Use the right arrow key to move to the data entry locations which follow the sequence of data you have accumulated on the Data Entry Worksheet in Appendix IV, Items 22 through 27.

Figure 5. Inflows Screen (Circled cells are for data input.)

Item	Amount Before Tax	Amount Of/ After Tax	Timing year		Present Value Factor	Present Value
	\$	\$	Start	End		\$
<b>INFLWS</b>						
<b>Savings or added returns from equip purch:</b>						
Avoided repairs on old eqpt	8,500	6,800	1	1	0.9537	6,485
Reduced annual repairs	840	672	2	10	6.8229	4,585
Annual fuel savings	50	40	1	10	7.7766	311
Impr timeliness, perform /yr	2,500	2,000	1	10	7.7766	15,553
<b>Cost recovery on eq purch (MACRS -less than 40% of assets purchased in 4th qtr; half-yr conv)</b>						
Sec 179	10,000	2,000	1		0.9259	1,852
14.29%	516	103	1		0.9259	96
24.50%	4,600	920	2		0.8573	789
17.49%	4,396	879	3		0.7938	698
12.50%	5,000	1,000	4		0.7350	735
8.92%	3,568	714	5		0.6806	486
8.92%	3,568	714	6		0.6302	450
8.92%	3,568	714	7		0.5835	416
4.46%	1,784	357	8		0.5403	193
Incr in end value because of new machine purchase	10,000	8,000	10		0.6225	4,980
State Inv. Tax Credit		2,000	1		0.9259	1,852
<b>NET INFLWS</b>						(2) \$39,480
<b>NET PRESENT VALUE</b>						(2-1) \$1,093

The following notes, referenced in Figure 5, will help explain the various parts of the INFLOW items. This section calculates the present value of receipts or reduced expenses that are expected to result from the combine purchase. It includes the recovery of the machine cost under the MACRS depreciation procedure. Again, Figure 5 shows more than one screen and you may want to use the right and left arrow keys to follow our discussion.

- a. There are four lines under "Savings ...." that can be used to describe different items under this heading. The four that are shown in Figure 5 illustrate possible items.
  - 1) The dealer told Dan that an \$8,500 overhaul would be necessary to prepare his old combine for the next season. Trading would avoid that cost during the first year. Hence, "1" is entered in the Timing Year columns, resulting in a present value of \$6,485. If the overhaul is necessary to complete the harvest season, enter "0" because the avoided repair cost would be immediate.
  - 2) Dan estimates annual repairs will average \$840 less in today's dollars for the new combine while he owns it than for the old combine if he kept it. The timing of these savings begins in Year 2 and ends in Year 10. The sum of nine years of present value factors in this case equals 6.8229 resulting in a total

- 3) Fuel savings are expected to average \$50 per year for Years 1 through 10. Present value of these fuel savings is \$311.
  - 4) Because of the improved harvesting efficiency of the new combine, Dan expects to save an extra two bushels of grain from 500 acres. At \$2.50 per bushel he would realize \$2,500 more income each year. Over 10 years, this would have a present value of \$15,553.
- b. The cost recovery (depreciation) section of the INPUT form assumes the use of MACRS depreciation and maximum use of the Section 179 expensing option. \$10,000 is expensed in Year 1 saving \$2,000 in income taxes and resulting in a present value of \$1,852. The next eight lines show an adaptation of the annual MACRS depreciation percent and amount before taxes. The annual tax savings are shown in the "after tax" column and the present values for each year are shown in the last column. The first three years of MACRS depreciation before tax have been adjusted downward to net out depreciation given up by trading in the old combine.
  - c. The next item shows Dan's estimate that the new combine would be worth \$10,000 more in 10 years than the old combine using current dollars. Using a 20 percent marginal tax rate, \$8,000 would be realized after taxes in the 10th year if the new combine was sold. This amounts to a present value of \$4,980.
  - d. Finally, Dan benefits from a four percent State investment tax credit at the end of Year 1. This \$2,000 credit has a present value of \$1,852. The total present value of the INFLOWS resulting from the purchase of the combine is \$39,480. Subtracting the OUTFLOWS from the INFLOWS produces a NET PRESENT VALUE of \$1,093.
- When the pointer moves to the first data entry location, press *RETURN* to calculate the results and return to the menu.
12. At this point, all data entry should be complete. The next step is to print the results unless you want to view the results on the screen before printing:

To view the results on the screen:

- Press Q for Quit. The program will calculate the results and control will leave the macro command mode and return to the Lotus Ready mode.
- Tab one screen to the right. The whole Outflow section does not fit on the screen. Therefore, press the right arrow key five times to bring the Present Value column into view. Press the Page Down Key once to see the Net Outflow total of \$38,387. Pressing the Page Down Key once more will reveal the Net Inflow total of \$39,480. Also, the goal of the exercise, the Net Present Value (NPV) is shown as \$1,093. From an economic point of view, a positive NPV indicates a positive decision to buy the machine should be made.

To print the results:

- If satisfied with the results and you want a printed copy, press *ALT M* to return to the main menu.
- Be sure the printer is on and properly set.



- Press *P* for Print (or press the right arrow key four times to move the pointer to the Print command and press *RETURN*).

The program will calculate the results, the screen will flutter, and the printer should print the results.

- Executing the PRINT command will cause the printer to print the report based on the data that have been entered. Upon completion, the title screen will be displayed.
- A sample printout is shown in Figure 6. This shows what the report should look like.
- If the printer does not respond to the PRINT command as expected:
  - Be sure the printer is on and properly set.
  - Otherwise, check the template's PRINT macro and your printer's setup codes for compatibility. See technical notes in Appendix II.
  - Select QUIT in the menu and press *RETURN* to return to the ready mode.
- If the PRINT command produces a report, examine the results.
  - If necessary, repeat the above procedure to make data changes where desired.
  - If the report is satisfactory:
    - Save the worksheet if desired:
      - Press *ALT M*, then *S* for SAVE/QUIT (or move the pointer to the SAVE/QUIT command in the menu and press *RETURN*). The program will recalculate the results, replace the existing file with the current data file, and return to the Ready mode.
      - Also save the worksheet on the disk with the original file (i.e. back up the worksheet you just saved).
    - Exit the Lotus program:
      - Press */QY* to return to the Lotus menu.
      - Press *E* to exit and return to the system prompt.

## INTERPRETING THE RESULTS

The printed report, as illustrated in Figure 6, is in tabular form and shows the inputted data as used to calculate the present values for the various outflows and inflows related to the equipment purchase decision. It also shows the assumptions used in the analysis.

The resulting difference between the present values of the inflows and outflows is the net present value (NPV) of the decision. A positive NPV would indicate the decision is economically sound; a negative NPV would discourage the decision on economic grounds. Obviously, the accuracy of the input data has a important effect on the resulting NPV. Therefore, it is important to use care in completing the Data Entry Worksheet so that the assumptions are as accurate and realistic as possible.

This machinery purchase decision aid includes the effects of using debt capital, income taxes, and inflation as well as performance differences over the life of the current and proposed piece of equipment. It will provide the user with a measure of the economic feasibility of the proposed purchase.

Figure 6. Results of Machinery Replacement Analysis

Date: 26-Jan-88      EQUIPMENT PURCHASE ANALYSIS      v88.1  
 Name: Dan Farmer      Machine: Self Propelled Combine

Item	Amount Before Tax	Amount Of/ After Tax	Timing year Start	Present End Value Factor	Present Value
<b>OUTFLOWS</b>	\$	\$			\$
Eqpt price less trade-in value	40,000				
Unrecovered cost on trade-in	10,000				
Down payment at time of sale	10,000			0	1.0000
Amount financed	30,000				10,000
Prin & Int :					
Year 1	7,193.74	6,504	1	0.9259	6,022
2	7,193.74	6,590	2	0.8573	5,650
3	7,193.74	6,686	3	0.7938	5,307
4	7,193.74	6,793	4	0.7350	4,993
5	7,193.74	6,912	5	0.6806	4,704
6	7,193.71	7,045	6	0.6302	4,440
7	0.00	0	7	0.0000	0
8	0.00	0	8	0.0000	0
9	0.00	0	9	0.0000	0
10	0.00	0	10	0.0000	0
11	0.00	0	11	0.0000	0
(Cash rec'd) : sale of old eqpt	(4,000)			1.0000	(4,000)
Taxable gain (loss) on eqpt sale	1,000	200	1	0.9259	185
ITC recapture on disposition		500	1	0.9259	463
Incr costs or decr returns /yr	100	80	1	10	7.7766
					622

**INFLOWS**      **NET OUTFLOWS**      (2)      \$38,387

Savings or added returns from equip purch:						
Avoided repairs on old eqpt	8,500	6,800	1	1	0.9537	6,485
Reduced annual repairs	840	672	2	10	6.8229	4,585
Annual fuel savings	50	40	1	10	7.7766	311
Impr timeliness, perform /yr	2,500	2,000	1	10	7.7766	15,553

Cost recovery on eq purch (MACRS -less than 40% of assets purchased in 4th qtr; half-yr conv)

Sec 179	10,000	2,000	1	0.9259	1,852
14.29%	516	103	1	0.9259	96
24.50%	4,600	920	2	0.8573	789
17.49%	4,396	879	3	0.7938	698
12.50%	5,000	1,000	4	0.7350	735
8.92%	3,568	714	5	0.6806	486
8.92%	3,568	714	6	0.6302	450
8.92%	3,568	714	7	0.5835	416
4.46%	1,784	357	8	0.5403	193

Incr in end value because of new machine purchase	10,000	8,000	10	0.6225	4,980
State Inv. Tax Credit		2,000	1	0.9259	1,852

**NET INFLOWS**      (2)      \$39,480

\*\*\*\*\*

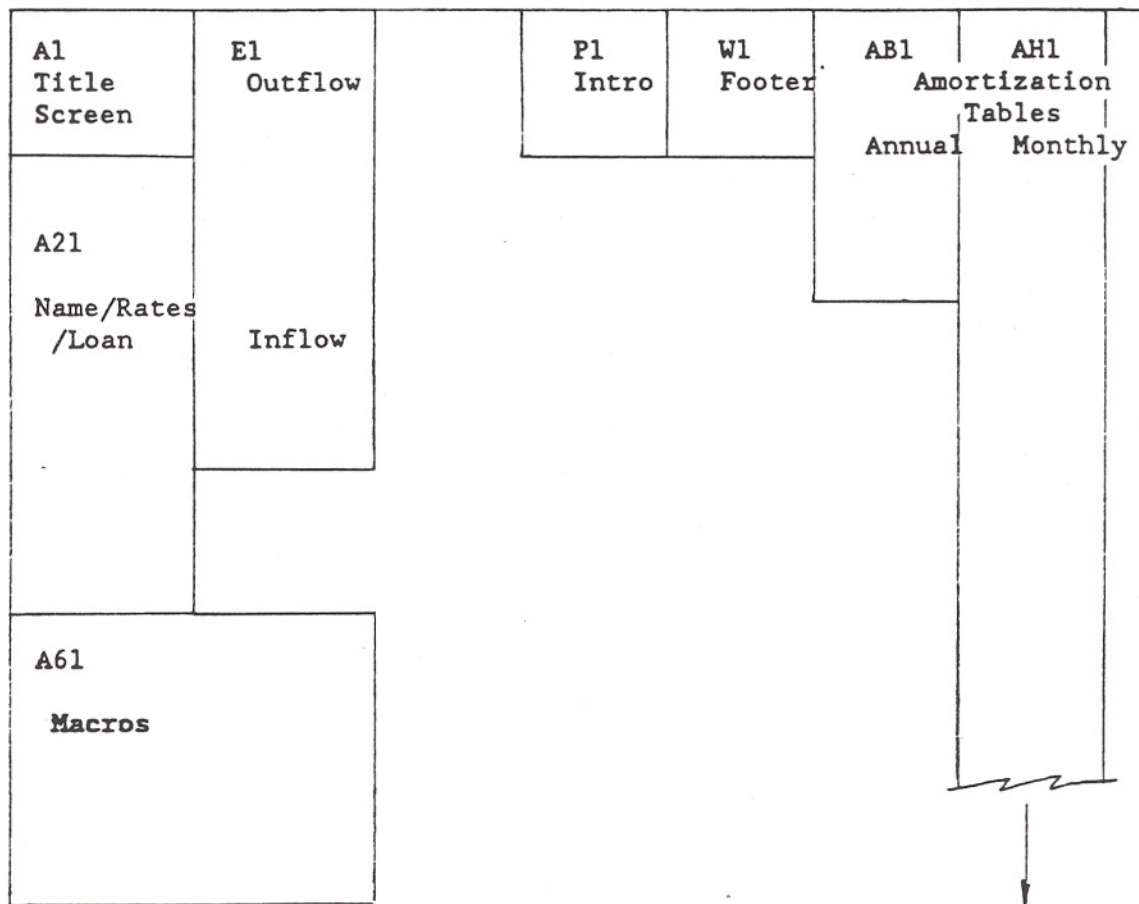
**NET PRESENT VALUE**      (2-1)      \$1,093

\*\*\*\*\*

NOMINAL WACC:	10.00%	SEC 179 ELECTION:	\$10,000
MARG TAX RATE:	20.00%	LOAN - AMOUNT:	\$30,000
INFLATION RATE:	3.00%	RATE:	11.50%
REAL AFTER TAX		TERM, YRS:	6.0
DISCOUNT RATE:	4.85%	ANNUAL PAYMENT:	7193.74
NOMINAL AFTER TAX		FIRST PAYMENT:	Year 1
DISCOUNT RATE:	8.00%		

## APPENDIX

## Appendix I. Layout of EQPUR881 Template



## Appendix II. Technical Notes

## 1. Changing the PRINT macro to conform to your printer's setup code:

- The EQPUR881 report is formatted so that the two title lines and the seven bottom lines are printed in normal print at 10 characters per inch. The body of the report (range name "TEMPLATE") is printed in compressed print at 17 characters per inch.
- The setup codes that control these changes are located within the PRINT macro.
- The layout of the EQPUR881 template is shown schematically in Appendix I. It shows the location of the macros on the Lotus spreadsheet relative to other parts of the template. These macros control the menu commands.
- The PRINT macro is located within the macro area.
- Press function key F5, then D75, then RETURN.
- Use the arrow keys to move the pointer to cell E80. The contents of the cell are displayed on the uppermost line on the screen more completely than at the pointer.
- Notice the current settings in this statement and the next two macro statements:  
  
 \030 instructs the printer for 10 CPI for the header named "PRINTINTRO".  
  
 \029 instructs the printer for 17 CPI for the body of the report "TEMPLATE".  
  
 \030 returns the printer to 10 CPI for the last seven lines named "PRINTFOOTER".
- Check your printer manual for the corresponding setup codes.
- If they agree, the setup codes are not the problem.
- If they differ, the setup codes in the PRINT macro must be changed. Proceed as follows:
- Disable the template protection feature by pressing: /WGPD.
- Press function F2 to edit the appropriate cell(s).
- Move the cursor (using the arrow keys) to the character(s) to be changed and enter the correct characters. Use the DEL key to delete the incorrect characters.
- Press RETURN to execute the edit function and repeat the previous step for other changes to be made.
- When editing is completed, reprotect the worksheet by pressing: /WGPE.

- Press *HOME* to return to the title screen.
- Press *ALT M*.
- Select *PRINT* from the menu and press *RETURN* to print the report.
- If successful the setup code changes are correct for your printer and computer. Save the file with the changes for future use.
  - Press *ALT M*, then *S* (for *SAVE/QUIT*) to replace the current *EQPUR881* file with the revised one.
  - When the screen returns to the ready mode, the file has been saved.
  - Also save the revised *EQPUR881* file on the original disk so you will have both an original and working (backup) copy of the revised *EQPUR881* template.
- If this attempt to print the report is unsuccessful, additional help may be needed to solve the problem.

## Appendix III.

To determine repair cost differences between the old combine and a new combine over the same 10 year planning period, several items must be known or assumed. In this example, the following information is used:

- \$56,000 current list price of a combine similar to the old machine.
- 150 hours of use per year.
- 750 hours on the old combine.
- 10 year planning period, i.e., either the old combine will be kept for another 10 years or the new combine will be kept for 10 years.

Using Tables 1 and 2 in this Appendix, the following procedure can be followed to determine annual repair cost differences:

At the beginning of the planning period the old combine has 750 hours on it and accumulated repair costs have totalled 15 percent of the current list price. If kept another 10 years the combine would have 2,250 hours and repairs would total 70 percent of list - an increase of 55 percent of list over the 10 years.

The new combine would have 1,500 hours on it at the end of 10 years with repairs totalling 40 percent of list.

Thus, combine repairs over the 10 years would be 15 percent (55 percent - 40 percent) of list less if the new combine is purchased.

Total repairs would be reduced by 15 percent of \$56,000 list or \$8,400 over the planning period of 10 years in this example. This results in reduced annual repairs of \$840 if the new combine is purchased.



## Appendix III.

Table 1. ACCUMULATED REPAIR COSTS AS A PERCENT OF THE MANUFACTURER'S LIST PRICE FOR FARM MACHINERY

Hours of Use	Tillage Tools, Rotary Hoe, Cutter- bar Mower, Culti- vator, Cultipacker	Fertilizer Equipment	4-Wheel Drive & <u>Crawler Tractors</u>		2-Wheel Drive
			Hours of Use	Repair Costs	<u>Tractors</u> Repair Costs
----- Percent -----					
50	0.8	0.5	--	--	--
125	4.0	3.0	500	0.5	0.5
250	8.0	7.0	1,000	1.0	3.0
500	20.0	36.0	2,000	7.0	8.0
750	34.0	62.0	3,000	12.0	15.0
1,000	48.0	94.0	4,000	18.0	23.0
1,250	65.0	130.0	5,000	26.0	32.0
1,500	82.0	--	6,000	35.0	42.0
1,750	100.0	--	7,000	45.0	54.0
2,000	120.0	--	8,000	55.0	66.0
			9,000	65.0	78.0
			10,000	76.0	91.0

Table 2. ACCUMULATED REPAIR COSTS AS A PERCENT OF THE MANUFACTURER'S LIST PRICE FOR FARM MACHINERY

Hours of Use	Self-Propelled Combine, Self-Propelled Forage Harvester, Front End Loader, Manure Spreader, Pickup Truck	P.T.O. Baler, Corn Picker, Forage Blower, Sprayer, Pull Type Forage Harvester	Corn Planter, Grain Drill, Mower Condi- tioner, Rake
	----- Percent -----		
50	0.3	0.1	0.3
125	0.5	0.5	0.8
250	4.0	3.0	4.0
500	8.0	8.0	10.0
750	15.0	14.0	28.0
1,000	23.0	22.0	38.0
1,250	32.0	30.0	52.0
1,500	40.0	39.0	67.0
1,750	50.0	48.0	83.0
2,000	60.0	58.0	100.0
2,250	70.0	69.0	--
2,500	83.0	80.0	--

## Appendix IV. Data Entry Worksheet

A. NAME/RATES/LOAN Screen data:

1. Dan Farmer Your name or farm name (20 characters maximum).
2. Self propelled combine Machine to be purchased (25 characters maximum).
3. 07 - 27 - 89 Today's date; month, day, year (numbers only).
4. .10 Nominal Weighted Average Cost of Capital. (WACC is the sum of the interest rate on debt weighted by the amount of debt as a percent of total assets and the rate you require for the use of your equity capital weighted by equity as a percent of total assets. The formula: (debt interest rate x debt/assets) + (equity interest rate x equity/assets) ← correction
- Some:  
Debt = \$125M  
Eqty = \$250M  
Assets = \$375M  
Debt int = 12%  
Eqty " = 9%
- $$\left( .12 \times \frac{125}{375} \right) + \left( .09 \times \frac{250}{375} \right) = .10$$
5. .20 Your marginal income tax rate. (The sum of marginal rates for both Federal and State income taxes you might expect to pay over the life of the machine.)
6. .03 Inflation rate. (A reasonable average annual rate expected over the life of the machine.)
7. \$10,000 IRS Code Section 179 election. (Amount of purchase price that will be expensed in the purchase year, current maximum amount is \$10,000 per farm.)
8. 2.5 Enter the years left to recover unused depreciation on the replaced equipment.
9. \$30,000 Amount of purchase price to be financed. (Amount borrowed.)
10. .115 Interest rate of the loan.
11. 6.0 Term of loan in years.
12. 1 Enter "1" if payments are to be made annually or "2" if monthly payments.
13. 1 Enter "1" if payments on the purchased equipment begin in the purchase year or "2" if payment begins the next year.

End of NAME/RATES/LOAN Screen data entryB. YEARS Screen data:

14. 7 Enter number of years for tax depreciation under MACRS. (Use "5" for trucks, computers, and cattle; use "7" for farm machinery, livestock structures, crop storage units, tile, etc.)

End of YEARS Screen data entry

C. OUTFLOW screen data:

15. \$ 40 000 Equipment price less trade-in value. (Boot price to be paid for the machine.)
16. \$ 10 000 Unrecovered cost of trade-in. (Book value.)
17. \$ (4000) Amount received for sale of old machine or part thereof. *(small grain head)* Enter as a negative amount. *This is an outflow section*
18. \$ 1000 Taxable gain or (loss) on sale of old machine. *(head)* (Sale price less book value and expense of sale.)  
*(4000 - 3000 BV) = 1000*
19. \$ 500 Investment tax credit to recapture (pay back) because of the trade-in or sale of the old machine, if any.
20. \$ 100 *more \$100* Any annual increased costs or decreased returns experienced as a result of the purchase of the new machine.
21. 10 Number of years in the planning period for analysis purposes.

End of OUTFLOW Screen data entryD. INFLOW Screen data:

22. \$ 8500 Cost of known repairs on the old machine that would be avoided if traded or sold.
23. \$ 840 Estimate of average annual reduction in repair costs. (Average annual repair costs for old machine if kept, less average annual repair costs for new machine if purchased. Use today's dollars. See example in Appendix III.)
24. \$ 50 Average annual fuel savings. (Average fuel costs for old machine less average fuel costs for new machine. Adjust for abnormal occurrences this year, but do not consider impact of inflation.)
25. \$ 2500 Average annual value of improved timeliness or performance in planting and/or harvesting. (For example, if the new combine has a lower harvest loss of two bushels per acre than the old combine: 2 bushels x \$2.50/bushel x 500 acres = \$2,500 added value received. Adjust for abnormal occurrences this year, but do not consider impact of inflation.)
26. \$ 10 000 Increase in salvage value because of the new machine purchase. (Salvage value of new machine if purchased less salvage value of old machine if kept. Use today's dollars.) *New, Salv = 10 000*  
*old, Salv = 0*
27. \$ 2000 State investment tax credit to be claimed if new machine is purchased.

End of INFLOW Screen data entry