CASH -Version 5.1

A General Cash Flow and Sensitivity Analysis Microcomputer Program for Conducting Project Analysis

User's Manual¹

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INSTALLATION OF CASH

Using DOS

Before using the CASH disk, make a working copy and label it. The CASH disk is not copy protected, so follow these steps to make a working copy on a diskette:

1. Put your DOS disk in drive A.
2. At the A>, type FORMAT B:/S and press <ENTER>.
3. Put a blank working copy disk in drive B.
4. Press any key to continue. When asked if you want to format another disk, type N and press <ENTER>, if necessary.
5. Remove your DOS disk from drive A, put the CASH program disk in drive A, type COPY A:*.* B:, and press <ENTER> to start the copy procedure.

Put the program disk away in a safe place and use the working copy for your applications. The working copy is for daily use. Do not cover the write protect notch on your working copy disk as the program writes temporary files to the disk during program operation. These temporary files are later erased when an analysis is completed.

You may also use the COPY command to transfer all program files to any other drive including a hard disk or utilize the SETUP program supplied with CASH.

Using SETUP Program

An installation program SETUP on the program diskette can be used also to install the program and all necessary files to any specified hard disk. Simply insert the program diskette in a drive, type <SETUP> and follow the simple instructions on the screen. The proper files will be copied to the hard disk. Drive "A" is the default input drive, but the system will determine from which drive the SETUP program was activated. The default destination drive and directory is C:\CASH. The SETUP program itself will also be saved to the hard disk. The following shows the input screens the user will see during installation:

CASH INSTALLATION PROGRAM

DEFAULT INPUT DRIVE for CASH files: A:
DEFAULT DESTINATION DRIVE for CASH files: C:\CASH

(1) Change input drive/directory for CASH files...
(2) Change destination drive/directory for CASH files...
(3) Install CASH as specified...
(4) Exit the installation program...

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Enter Drive/Directory String, e.g. C: or C:\FILES: B:
CASH INSTALLATION PROGRAM

NEW INPUT DRIVE for CASH files: B:\
DEFAULT DESTINATION DRIVE for CASH file: C:\CASH

(1) Change input drive/directory for CASH files...
(2) Change destination drive/directory for CASH files...
(3) Install CASH as specified...
(4) Exit the installation program...

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Enter Drive/Directory String, e.g. C: or C:\FILES: D:\CASH

CASH INSTALLATION PROGRAM

NEW INPUT DRIVE for CASH files: A:\
NEW DESTINATION DRIVE for CASH files: D:\CASH

(1) Change input drive/directory for CASH files...
(2) Change destination drive/directory for CASH files...
(3) Install CASH as specified...
(4) Exit the installation program...

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Copying files to directory:D:\CASH
C:\BC7\FILES\CASH.EXE
C:\BC7\FILES\SETUP.EXE
 2 File(s) copied
C:\BC7\FILES\CASHDAT.EXE
 1 File(s) copied

CASH program has been successfully installed in drive D:\CASH
Press a key to continue...

CASH INSTALLATION PROGRAM

NEW INPUT DRIVE for CASH files: A:\
NEW DESTINATION DRIVE for CASH files: D:\CASH

(1) Change input drive/directory for CASH files...
(2) Change destination drive/directory for CASH files...
(3) Install CASH as specified...
(4) Exit the installation program...

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

To run CASH, simply type <CASH> from the created directory
Press a key to continue...
RUNNING THE PROGRAM

Place the CASH disk in drive A and close the disk drive door. If the computer is off, turn it on and enter the date and time when prompted to do so. The program will then load and start to run automatically. If the computer is on and you see the A> on the screen, type CASH and then press the <ENTER> key. Do not cover the write protect notch on your working copy disk as the program writes temporary files to the disk during program operation. These temporary files are later erased when an analysis is completed.

Data files saved under earlier versions of CASH are not directly compatible with this program version. Each existing data file must be edited (see appendix B for format). If you run CASH from a hard disk, simply move to the directory containing the CASH files, and type CASH and then press the <ENTER> key.

INTRODUCTION

Discounted cash flow and sensitivity analysis are major tools used when evaluating and comparing alternatives during investment analysis. However, evaluating all of the various potential alternatives may require performing many calculations. This process can become extremely tedious and time consuming, especially when there are many alternatives. Therefore, microcomputer investment analysis algorithms have been developed to simplify the task of enumerating the various alternatives. The user is only required to input discount rates and the timing and amount of investment costs and revenues when using these models. Interest factors are then computed internally. However, access to these models does not diminish the decision makers need to understand the conceptual basis of financial analysis and the importance of the data inputs required for application of these tools. The user is encouraged to carefully study a guidebook on forestry investment analysis developed by Rose and Blinn (1985).

CASH is a menu-driven microcomputer program written in Microsoft BASIC for application on the IBM personal computer and its compatibles. These computers must have at least 300K of available RAM. The amount of available RAM is defined as the total amount of RAM in your computer minus the amount allocated to DOS and any utility programs that may be installed. The program allows the user to quickly evaluate cash flows of costs and receipts (costs or benefits) over the investment period for any type of investment alternative (i.e., forestry, agriculture, engineering, home economics, marketing, etc.). For each alternative, the program calculates cash flows by period and various economic measures of investment performance. In addition, it conducts sensitivity analysis on the discount rate and each activity included in the analysis.

Input data required for the program consists of the period (year, quarter, month, etc.) in which the last cash flow occurs, the real discount rate or nominal discount rate and general inflation rates, and the appropriate cash flow for each cost and revenue activity. Data may be easily edited before the various economic measures are calculated. All user inputs are checked by the program for correctness. An error message will appear on the screen if the user entered an unacceptable input value.
The objectives of this manual are:

1. To describe the use of the computer program CASH for investment analysis.

2. To interpret the output of the program through the application of an example.

3. To present the above description and interpretation in a manner suitable for classroom instruction and independent study.

PROGRAM INPUTS AND OUTPUTS

Program Inputs

CASH can be used to organize and develop a cash flow table to calculate the various measures of investment worth and to analyze the uncertainty associated with the alternative being evaluated. The analyst still must derive by hand the technical relationships and the cost and revenue cash flows to enter into the program. This individual also has to interpret the results or output generated by the program.

Program input consists of entering the following information, within the given ranges specified:

A. Number of title lines (1-5 lines, 60 characters/line).
B. Period (year) in which the last cash flow occurs (1-200).
C. Method by which the user will scale all cash flow estimates if any of the values are greater than $99,999.99 (Select 1, 2, 3, or 4).
   1. Values will not be scaled.
   2. Values entered in hundreds of dollars.
   3. Values entered in thousands of dollars.
   4. Values entered in millions of dollars.

D. Measurement unit and number assumed in the analysis.
   1. Acres (number)
   2. Units (number)

E. Type of discount rate that will be used.
   1. Real (all cash flows are in real terms, net of inflation).
   2. Nominal (combined real discount rate and general inflation rate).

F. Real discount rate (if a real analysis is desired).
G. Nominal discount rate (if a nominal analysis is desired).
H. General inflation rate (if a nominal analysis is desired).
I. Number of cost and revenue activities (maximum of 30 of each type of activity).
J. For each activity:
1. Name (12 character limit).
2. Rate of inflation if different than that specified above.
3. Frequency of occurrence
   a. Single
   b. Continuous periods
   c. Discontinuous periods
4. Period(s) of occurrence
5. Cash flow per acre (per unit) in today's dollars

An option to save program input values is provided.

After all data has been entered, it may be easily edited from the DATA EDITING MENU. Costs and returns may also be both added and/or deleted from this menu.

CASH assumes that all cash flows occur at the beginning of the indicated period. If the user wishes to specify a 60-year rotation (i.e., 60 discounting periods) the last cash flow would occur in period 61. Care must be taken to properly set the period in which the last cash flow occurs and to enter the appropriate period of occurrence for each activity. The user must enter all cash flows in period 1 dollars.

Program Outputs - Economic Performance Measures

After all input data has been entered and the appropriate calculations have been performed by the program, CASH provides an option to print out the following information to the screen, to the printer, and/or to a disk file;

A. Program input values
B. Cash flow report by period (optional)
C. Net present value at various real and nominal (if a nominal analysis was conducted) discount rates

D. The following economic measures of investment performance:
   1. Net present value (NPV)
   2. Equivalent annual (period) income (EAI)
   3. Soil expectation value (SEV)
   4. Benefits over costs
   5. Payback period
   6. Real internal rate of return
   7. Nominal internal rate of return (if a nominal analysis was conducted)

E. Sensitivity analysis for NPV, EAI, and SEV to a 10 percent change in input value for each cost and revenue activity.
F. Risk analysis (i.e., the amount of change necessary for each cost and revenue activity to force NPV to $0.00, up to a maximum of 100 percent).
The economic performance measures NPV, EAI, SEV, benefits over costs, and payback period are all calculated using the input discount rate. When calculating the economic performance measures, CASH assumes that the beginning of the investment occurs during period (year) one. All cash flows are discounted back to the beginning of period one when NPV is calculated. If the user specifies that the last cash flow occurs in period six, there are five discounting periods.

**Program Outputs - Sensitivity Analysis**

A desirable procedure in any analysis is to examine how sensitive various measures of investment performance are to changes in expenditures, prices, interest rates, and other inputs (e.g., machine production rates, time constraints on a silvicultural activity, etc.) The reason for such sensitivity analysis is that most estimates of inputs and outputs are interval estimates rather than point estimates. In other words, individual estimates have errors associated with them that might be expressed by putting limits of confidence around them. Knowledge of the sensitivity of an investment to the various factors that may affect it is an essential part of any investment analysis. It gives valuable insights into what might happen if yields, prices, and/or costs turned out differently than expected.

Three types of sensitivity analysis are automatically carried out within CASH. First, a table is provided to display a profile of NPV for the investment at various discount rates. This allows the analyst to assess the effect of the discount rate employed in the analysis on NPV. For a nominal analysis, the table includes columns for both real and nominal discount rates.

The second sensitivity analysis table shows the amount of change that would occur in NPV, EAI, and SEV due to a 10 percent increase or decrease in each expenditure and receipt. The relative magnitudes of the changes indicate the relative impacts of changes in the expenditures and receipts. The larger the number in a given column, the greater the impact resulting from a given percentage change.

The last sensitivity analysis table shows the percent changes in activities (expenditures and receipts) necessary to make NPV exactly equal to $0.00. The maximum percent change calculated is 100 percent.

**INSTRUCTIONS FOR USING CASH**

The user should make backup copies of the program diskette before running the program. Backup copies should be used to run the program. The diskette should not have a write protect tab when it is being used because various files are written on the diskette during operation of the program. These files are automatically erased when an analysis is completed.

In this section, the various CASH input screens will be displayed and discussed to provide assistance when entering and/or editing data. After inserting the CASH program disk into drive A or B, type CASH and then press the <ENTER> key. The <ENTER> key is used to send typed information from the keyboard and the screen (monitor) to the central processing unit of the microcomputer. The <ENTER> key must be pressed after typing in the appropriate
response to the various data entry prompts within the program. After completing the above step, CASH will display the program title screen:

```
CASH Version 5.1
Cash Flow and Sensitivity Analysis Program
Written By
Dietmar W. Rose
Department of Forest Resources
University of Minnesota
Portions Copyright Microsoft Basic 7.1, 1990.
All rights reserved.
Copyright 1992 by Dietmar Rose.

Press any key to continue....
```

```
CASH SOFTWARE DISCLAIMER
All the software on the CASH diskette has been extensively tested and checked for accuracy and, to the best of the author's knowledge, contains no errors. However, the author does not provide any guarantees and is not responsible for errors that may arise during the use of this software. Any errors found by the users should be brought to the author's attention in order to incorporate appropriate changes in future versions. Major future revisions of CASH will be available by returning the program diskette or a blank diskette and a check for $15 payable to the author. Please call or write if you have questions. For permission to use or copy this software or obtain CASH updates write to:

Dr. Dietmar W. Rose
1539 12th Terrace NW
New Brighton, MN 55112
Tel.: (612)636-7395 or
(621)624-9711
FAX: (621)625-5212

Press any key to continue....
```

Press any key to exit the software disclaimer screen and to display the following CASH MAIN MENU screen:
CASH MAIN MENU Option 1 - Overview

This option provides a brief overview of the CASH program. This information appears on two screens. After reading the first overview screen, press any key to review the second screen. After reading the second screen, press any key to return to the MAIN MENU. The overview screens are shown below:

Overview

CASH is a user-friendly microcomputer program written for IBM and compatible personal computers in Microsoft Professional Basic 7.1. The PC should have at least 300K of available RAM memory.

CASH is a decision aid which makes it possible to rank alternative investments based on several investment analysis criteria. It may be used for any type of investment alternative: forestry, agriculture, engineering, home economics, marketing, etc. For each alternative, the program calculates cash flows by period for an analysis up to 100 periods (years) plus various economic measures of investment performance.

Press any key to continue....
Overview (cont)
In addition, it conducts a sensitivity analysis on the discount rate and each activity included in the analysis. Up to 30 cost and revenue activities each can be included in the analysis. The user need enter only the discount rates along with the amount and timing of investment costs and revenues. However, it is assumed that the user understands the concepts underlying financial analysis and has the knowledge required to interpret and apply the results. One source of additional background information is listed in the Technical Reference (choice 2 on the MAIN MENU).

Press any key to continue....

Overview (cont)
The current and any previous cash flow analysis, both inputs and outputs, that have been saved to a disk can be viewed or printed from within CASH under options 6 and 7 of the CASH MAIN MENU. CASH also comes with an integrated graphics program which allows the user to view graphical output of the current or previously created key cash flow inputs and outputs that have been saved.

Press any key to continue....

CASH MAIN MENU Option 2 - Technical Reference

This option provides a citation for a guidebook on investment analysis. After reading the information presented concerning the technical reference, press any key to return to the MAIN MENU.
Technical Reference

This guidebook on forestry investment analysis provides important background information on financial analysis concepts and applications:


Press any key to continue....

CASH MAIN MENU Option 3 - Set Paths Defaults

This option allows the user to set the directories and paths from where data will be read and where outputs will be stored. The program reads in default values from file "CASH.PTH". When the user changes any path parameters, the new values will be written to this file and will become the default values the next time CASH is being run. When entering on a highlighted item, the program will prompt the user for a new path and retain the old path, if no new value is entered:

SET FILE DRIVE PATHS
1. Current Cash Data File Directory c:\cash\DATA
2. Current Cash Run Output Directory c:\cash\output\n3. Finished- Accept Current Settings

Enter the path you wish to change
Use Arrow or Number Keys to highlight
Press Spacebar or Enter to execute
Enter new path for data files

10
CASH MAIN MENU Option 4 - Sample Run

This option provides users the opportunity to see the application of the program. A sample data set (CASH.EXP) is automatically loaded into the program and the user is then given an option to view the analysis data before calculations are performed. The program will display an error message if this file is not on the same directory as the CASH program. With this option, the user will see the Main Editing Menu:

MAIN EDITING MENU

1. View analysis data
2. Edit analysis data
3. Perform calculations
4. Return to MAIN MENU

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

For option 3, Perform calculations, the user will be asked if a detailed cash flow table is to be generated, followed by an option to save the output into a default or user-specified file:

Do you want the detailed cash flow table?
Yes  No

Saving Cash Flow Results
Enter path or <ENTER> for default path: c:\cash\output\

Enter data filename, or press only <ENTER> to use default name: c:\cash\output\Cash.TBL

At this point, the user can review the cash flow results on the screen using option 1 or return to the editing menu. If the run data were saved, they can always be reviewed or printed later from main menu options 6 and 7.

CASH OUTPUT SELECTION MENU

1. Display reports on the screen
2. Return to the CASH MAIN EDITING MENU

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

You may press the <F10> key any time to stop viewing data
Press a key to continue...
MAIN EDITING MENU Option 1 - View analysis data

The screen will display the data inputs for the sample file. The program automatically fills as many screens as necessary to view the data, with a pause between screens. Scrolling may be reinitiated by pressing any key.

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>ACTIVITY</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planting</td>
<td>1</td>
<td>484.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>Weed Control</td>
<td>1 - 2</td>
<td>30.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>Mgmt &amp; Taxes</td>
<td>1 - 9</td>
<td>60.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>Spraying</td>
<td>1 - 8</td>
<td>20.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Press any key to continue....

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>ACTIVITY</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Fertilize</td>
<td>3</td>
<td>10.00</td>
<td>0.50</td>
</tr>
<tr>
<td>6</td>
<td>Shearing</td>
<td>3</td>
<td>64.82</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>64.82</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>101.86</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>111.12</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>120.38</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>101.85</td>
<td>0.50</td>
</tr>
<tr>
<td>7</td>
<td>Clean Site</td>
<td>8</td>
<td>150.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Press any key to continue....
MAIN EDITING MENU Option 2 - Edit analysis data

The following screen will be displayed to perform editing of any of the data inputs:

<table>
<thead>
<tr>
<th>CASH DATA EDITING MENU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Edit general investment data</td>
</tr>
<tr>
<td>2. Edit cost activities</td>
</tr>
<tr>
<td>3. Edit revenue activities</td>
</tr>
<tr>
<td>4. Add cost or revenue activities</td>
</tr>
<tr>
<td>5. Delete cost or revenue activities</td>
</tr>
<tr>
<td>6. No editing or editing completed</td>
</tr>
</tbody>
</table>

CASH DATA EDITING MENU Option 1 - Edit general investment data

This option may be selected to edit any of the general investment data. It will display the following screen:

<table>
<thead>
<tr>
<th>Cash Flow Run Parameters Editing Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highlight the parameter you wish to edit using the arrow keys.</td>
</tr>
<tr>
<td>Press &lt;E&gt; to edit the parameter and &lt;Q&gt; or &lt;ESC&gt; to quit.</td>
</tr>
<tr>
<td>1. Title exists : Yes</td>
</tr>
<tr>
<td>2. Number of periods in cash flow : 10</td>
</tr>
<tr>
<td>3. Monetary units : dollars</td>
</tr>
<tr>
<td>4. Monetary scaling units : dollars</td>
</tr>
<tr>
<td>5. Project units : acre(s)</td>
</tr>
<tr>
<td>6. Project size : 1</td>
</tr>
<tr>
<td>7. Number of cost activities : 7</td>
</tr>
<tr>
<td>8. Number of revenue activities : 1</td>
</tr>
<tr>
<td>9. Change type of discount rate : Real</td>
</tr>
<tr>
<td>10. Real discount rate : 5</td>
</tr>
</tbody>
</table>

The CASH DATA EDITING MENU option permits the editing of any of the general investment data (i.e., title, investment size, unit of measure, length of analysis, coding of dollar values, discount rate, or general inflation rate (in a nominal analysis)). Type the number of the item you wish to change and press <ENTER>. While investment length may be increased or decreased, a warning message will appear if cash flows will be lost by decreasing the length. This message indicates the number of cost and/or revenue activities that will have to be altered (i.e., period of occurrence) by selecting Options 2 and/or 3, respectively, from the CASH DATA EDITING MENU before investment length may be decreased.

For each item selected a specific input will be requested. Below is a summary of the screen images that will appear for each item in the order displayed in the editing screen. After the edit, the screen will immediately display the new values.

While the user is editing data, the top portion of the screen will display the original data entries for the parameter(s) currently being edited. Editing changes are entered on the bottom half of the screen according to data entry prompts. As soon as a change has been made, the new values
will be displayed on the top portion of the screen for immediate verification by the user. Press <ENTER> to retain the existing information after selecting an item to be changed. Enter C to exit this menu and to return to the DATA EDITING MENU once all editing has been completed.

Do you want to input a new title?
Yes
No

Enter new last period in which an activity occurs?

Input monetary units to be used?

Scaling Factor Selection Menu
1. Values are not scaled, dollars
2. Values in hundreds of dollars
3. Values in thousands dollars
4. Values in millions of dollars
Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Is the investment measured in a land unit?
Yes
No

Enter new project size?

Enter new number of cost activities?

Enter new number of revenue activities?

Enter new real rate ?

Type of rate that will be used for discounting all cash flows:
1. Real (all cash flows are in real terms, net of inflation)
2. Nominal (combines real discount rate and general inflation rate)
Select by entering one of the highlighted letters below:
Real
Nominal

Enter new Nominal discount rate in percent?

Enter new general inflation rate in percent?

The EDITING MENU has more items if a nominal analysis was selected initially. In this case, items 11-12 appear on the menu.

Cash Flow Run Parameters Editing Menu
Highlight the parameter you wish to edit using the arrow keys. Press <E> to edit the parameter and <G> or <ESC> to quit.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Title exists</td>
<td>Yes</td>
</tr>
<tr>
<td>2. Number of periods in cash flow</td>
<td>10</td>
</tr>
<tr>
<td>3. Monetary units</td>
<td>pesos</td>
</tr>
<tr>
<td>4. Monetary scaling units</td>
<td>pesos</td>
</tr>
<tr>
<td>5. Project units</td>
<td>units</td>
</tr>
<tr>
<td>6. Project size</td>
<td>1</td>
</tr>
<tr>
<td>7. Number of cost activities</td>
<td>7</td>
</tr>
<tr>
<td>8. Number of revenue activities</td>
<td>1</td>
</tr>
<tr>
<td>9. Change type of discount rate</td>
<td>Nominal</td>
</tr>
<tr>
<td>10. Nominal discount rate</td>
<td>8</td>
</tr>
<tr>
<td>11. General inflation rate</td>
<td>3</td>
</tr>
<tr>
<td>12. Implied real discount rate</td>
<td>4.854369</td>
</tr>
</tbody>
</table>

Key information from these various screens is summarized below. The user has the option of editing the title for the investment. Title information will subsequently appear on the top of each page of the CASH output. If you want to discontinue entry of title lines, press <ENTER> twice.

The last period in which an activity occurs must be entered. A period may be any unit of time that best suits the analysis. A period will often be one year, but could also be one month, one quarter, etc.

Because the program will not accept cash flows larger than $99,999.99, the user will need to scale all entry values if any of them are larger than this amount. Values are scaled by dividing all cash flows by the user selected scaling factor before entry into the program. Enter the number (1, 2, 3, or 4) which corresponds to the method by which cash flows will be scaled before they are entered into the program. As an example, if the largest cash flow is $800,000, the user must initially divide all cash flows by either 100 (option 2) or 1,000 (option 3) before any cash flows are entered. The largest cash flow entered into CASH would then be $8,000 or $800, if options 2 or 3 were selected, respectively. If a scale choice is selected, all output report dollar values will have to be multiplied by the scale choice selected to put the output values in the proper scale once again.

Enter whether the investment is measured in acres or units and the appropriate number. This information is only used for reporting purposes on the output reports as all analyses are performed and reported on either a per land unit (acre, ha etc.) or a per unit basis.

Analyses may be performed using real or nominal discount rates. A real rate assumes that all cash flows are entered in real terms, net of inflation. A nominal rate assumes that a general inflation rate is to be combined with a real rate to generate the specified nominal discount rate. The program will require the following information:

For a real rate, only the real discount rate would be entered. For example, to enter a real rate of 5 percent, the user would enter either 5 or 5.0. For a nominal rate, both the nominal rate and the general inflation rate must be entered:
For nominal analyses, the program calculates an implied real discount rate that is assumed in the analysis. This real discount rate, when combined with the general inflation rate, will yield the entered nominal discount rate. The real rate is calculated from the nominal discount rate and the general inflation rate using:

\[
\text{Assumed real rate (in percent)} = \left[ \frac{(1 + \text{NR/100})}{(1 + \text{GI/100})} - 1 \right] \times 100
\]

where:

NR = nominal rate in percent (per period)
GI = general inflation rate in percent (per period)

The general inflation rate entered into the analysis must be less than or equal to the nominal discount rate.

For example, if the user specifies a nominal rate of 8 percent for discounting purposes and also specifies a general inflation rate of 3 percent, the real rate would be:

\[
\text{Real Rate} = \left[ \frac{(1 + 0.08)}{(1 + 0.03)} \right] - 1 = 0.0485 \text{ or } 4.85 \text{ percent.}
\]

If a nominal analysis is performed and the nominal rate is specified as 8.0 percent and the general inflation rate is entered as 3.0 percent, the discount rate used in the analysis will be 8.0 percent. To make a parallel comparison to an analysis that uses only real values net of inflation, the user would have to use a real discount rate of 4.85 percent. This would lead to identical analytical results as long as all cash flow inputs consistently reflected real versus nominal values in the analysis.

**CASH DATA EDITING MENU Options 2 and 3 - Edit cost or revenue activities**

Existing cost and revenue activities may be edited by entering 2 and 3, respectively. A numbered list of cost (or revenue) activity names appears. This option allows the user to view all of the cost or revenue activities and to change any activity name, difference in inflation rate, type of occurrence, period(s) of occurrence, and the corresponding cash flow in today’s dollars by selecting the appropriate activity number. Numbers refer to the numeric order in which individual cost and revenue activities were entered. Press <ENTER> to keep information in the current field after selecting an activity to edit if you do not want to change that field. This allows the user to avoid having to retype correct information. Enter C to exit these options and to return to the DATA EDITING MENU once all corrections have been made. The screen will display:
## COST ACTIVITIES

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>NAME</th>
<th>PERIOD</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planting</td>
<td>1</td>
<td>484.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>Weed Control</td>
<td>1 - 2</td>
<td>30.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>Mgmt &amp; Taxes</td>
<td>1 - 9</td>
<td>60.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>Spraying</td>
<td>1 - 8</td>
<td>20.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>Fertilize</td>
<td>Discontinuous* (2)</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Shearing</td>
<td>Discontinuous* (6)</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Clean Site</td>
<td>8</td>
<td>150.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

---

Lack of screen space prevents the period of occurrence and current price for discontinuous activities from being printed in the table. The number of occurrences is shown in parentheses. The values will be shown when editing the activity.

Press a key to continue...

Enter the number of the variable to be edited: 1
(Enter <C> when editing has been completed)
Name (12 char. max.):  

Press <ENTER> to retain variable unchanged

Enter the additional inflation rate above or below the general inflation rate. Enter 0 for no difference, use a <> sign for negative values:  

Type of Occurrence: 1. No change or retain  
2. Single  
3. Continuous periods  
4. Discontinuous periods

Single Occurrence

Period of occurrence: 1  
Cost in today's dollars: 484

<ENTER> ACCEPT DATA <E> EDIT DATA  

Single Occurrence

Period of occurrence for Planting:  

Press <ENTER> to retain variable unchanged

Single Occurrence

Period of occurrence for Planting: 1  
Cost for Planting in today's dollars: 495

Press <ENTER> to retain variable unchanged

Single Occurrence

Period of occurrence: 1  
Cost in today's dollars: 495

<ENTER> ACCEPT DATA <E> EDIT DATA  

17
REVENUE ACTIVITIES

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>NAME</th>
<th>PERIOD</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tree Sales</td>
<td>Discontinuous* (2)</td>
<td></td>
<td>0.00</td>
</tr>
</tbody>
</table>

Enter the number of the variable to be edited: ↘ ↗
(Enter <C> when editing has been completed)

CASH DATA EDITING MENU Option 4 - Add cost or revenue activity

Enter 4 to add a cost or revenue activity and then specify which type of activity is to be added. The program will provide prompts for all of the data required. The screen will display:

ACTIVITY ADDITION MENU

1. Add a cost activity
2. Add a revenue activity
3. Return to DATA EDITING MENU

Name (12 char. max.): ↘ ↗

After adding each cost or revenue activity, the program will advance to the next item on the CASH DATA EDITING MENU.

CASH DATA EDITING MENU Option 5 - Delete cost or revenue activity

Enter 5 to delete a cost or revenue activity and then specify which type of activity is to be deleted.

ACTIVITY DELETION MENU

1. Delete a cost activity
2. Delete a revenue activity
3. Return to DATA EDITING MENU

The program will then display the appropriate activity names and their corresponding number. The screen will display:
COST ACTIVITIES

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planting</td>
</tr>
<tr>
<td>2</td>
<td>Weed Control</td>
</tr>
<tr>
<td>3</td>
<td>Mgmt &amp; Taxes</td>
</tr>
<tr>
<td>4</td>
<td>Spraying</td>
</tr>
<tr>
<td>5</td>
<td>Fertilize</td>
</tr>
<tr>
<td>6</td>
<td>Shearing</td>
</tr>
<tr>
<td>7</td>
<td>Clean Site</td>
</tr>
<tr>
<td>8</td>
<td>Fertilize</td>
</tr>
</tbody>
</table>

Enter the number of the activity to be deleted: < >
(Enter <cr> when deletion has been completed)

The program will automatically delete the specified activity. The numbered list of activities is automatically renumbered sequentially if any activity other than the last one is deleted.

[Only the original data file has been saved. You must save your editing changes if these are to be used in the analysis. Do you want to save the corrections?]

Yes
No

Enter N if you do not wish to save the corrections made from the DATA EDITING MENU. The program will then automatically ask if you are sure. Enter Y if you are sure that you do not want to save these corrections or N if you did intend to save them. [CAUTION: Data corrections will not be incorporated into the analysis unless they are first saved. Therefore, save all editing changes if it is desired to incorporate these corrections into the analysis.]

Enter Y at the initial prompt to save corrections. Corrections may be saved in the original data file specified by pressing the <ENTER> key. This will overwrite all existing data in that file, causing you to lose that information. Enter N, the appropriate disk drive, and file name if the data is to be saved in a new data file.

After data editing, the program does a check of all discontinuous period activities to see if two or more occurrences of the same activity occur within the same period. If the program discovers that multiple occurrences have been entered in any one year for any single activity, it automatically forces the user to make appropriate corrections through the DATA EDITING MENU. If an error associated with a periodic activity is discovered in this phase, the program will produce a screen prompt, e.g.,:

Cost activity 5 occurs more than once in the same period.
You must edit the activity before performing any analyses.
The program cannot be run with the data in this form.

Press a key to continue...

The program now automatically shows a summary of the input data so that the user may discover where the input error(s) was (were) made. The next screen display that will automatically follow is:
The user will be required at this point to fix the data by selecting the appropriate option from the DATA EDITING MENU. The program will not permit the user to continue with the next program step until the data has been fixed.

CASH DATA EDITING MENU Option 6 - No editing or editing completed

Enter 6 to return to the MAIN EDITING MENU after all changes have been made to the data. The user will then be prompted as to whether or not the corrections made during the editing process are to be saved.

CASH DATA EDITING MENU

1. Edit general investment data
2. Edit cost activities
3. Edit revenue activities
4. Add cost or revenue activities
5. Delete cost or revenue activities
6. No editing or editing completed

No changes were made while editing
Press a key to continue...

MAIN EDITING MENU Option 3 - Perform Calculations

With this option, the program begins the calculations. First, the following message will appear on the screen:

You may now press the <F10> key any time to stop calculations
Press a key to continue...

Calculations in Progress

Do you want the cash flow table displayed?
Yes No

The latter message will stay on the screen until the calculations are completed. Then the OUTPUT SELECTION MENU appears:
CASH OUTPUT SELECTION MENU

1. Display reports on the screen
2. Return to the CASH MAIN EDITING MENU

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

CASH OUTPUT SELECTION MENU Option 1 - Display reports on the screen

If output is to appear on the screen, option 1 is selected. A choice can now be made on whether to display the cash flow table:

You may press the <F10> key any time to stop viewing data
Press a key to continue...

Enter Y if you want the cash flow table displayed or N if you do not want this table displayed in the output report. The F10 key may be pressed at any time while reports are being output to the screen to suspend display and to return to the OUTPUT SELECTION MENU. In addition to displaying the appropriate cash flow by period for each activity, accounting for inflation, this table also lists the following information for each period: (1) total cost, (2) cumulative total costs, (3) total revenues, (4) cumulative total revenues, (5) net revenues, and (6) cumulative net revenue. The cash flow table is displayed by 5 period increments, up to the last period in which an activity occurs.

By displaying all cash flows, a detailed review of input correctness may be conducted. This review is especially important when individual items are inflated at different rates or a general inflation rate is assumed. The user should keep in mind that today's costs and revenues are shown in the summary of analysis input values and that the program makes the proper calculations to inflate the cash flow, where appropriate, to the period in which it occurs. Press any key to continue scrolling through the reports after reviewing each output screen.

CASH OUTPUT SELECTION MENU Option 2 - Return to the CASH MAIN EDITING MENU

Enter 2 to return to the CASH MAIN EDITING MENU to perform other analyses or to exit the program. This option may also be chosen when the OUTPUT SELECTION MENU reappears after selecting options 1 or 2.

MAIN EDITING MENU Option 4 - Return to the MAIN MENU

This option will return the user to the CASH MAIN MENU.
CASH MAIN MENU Option 5 - Run CASH

This option allows the user to either enter data for a new investment from the keyboard or to recall previously stored data from a disk. The following CASHFLOW DATA INPUT MENU will appear:

```
CASH DATA INPUT MENU

1. Recall parameters stored on disk.
2. Enter new data.
3. Return to Main Menu.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
```

CASHFLOW DATA INPUT MENU Option 1 - Recall parameters stored on disk

For this option, the following screen will appear:

```
CASH DATA FILE ENTRY CHOICES

1. See the list of filenames.
2. Enter the data filename.
3. Return to the MAIN MENU.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
```

CASH DATA FILE ENTRY CHOICE 1 - See the list of filenames

This option will retrieve an existing data file that was previously created with the CASHFLOW RUN PARAMETERS INPUT MENU (see page 11). All of these files have a .DAT extension as a part of their file name. Data in this file may be edited and saved and economic analyses may be performed. The program will request information on the file to be used. From the CASH DATA FILE ENTRY CHOICES Menu, the user may request to see a list of data file names, enter the file name for a specific data file to be recalled or return to the MAIN MENU.

For option 1, the user will see the default data path which can be changed, followed by a list of files with extension ".DAT" (i.e., the extensions appended to CASH data files) for a user specified disk drive). The user can select a file by hitting the <Enter> key on a highlighted file:
Enter path or <ENTER> for default path: c:\cash\DATA
(1) GEIS77.DAT  
(2) MNREDACE.DAT  
(3) CASH.DAT  
(4) ACES.DAT  
(5) CASHDATA.DAT  
(6) CASH1.DAT  
(7) RPIVL.DAT  
(8) RPV1NOTH.DAT  
(9) FR5226.DAT  
(10) More...

Select by entering a number or highlight using cursor and pressing <Enter> or Spacebar

CASH DATA FILE ENTRY CHOICE 2 - Enter the data filename

This option will retrieve an existing data file that was previously created with CASH. All stand files have a "DAT" extension as a part of their file names. Therefore, to recall the data file called FILE1.DAT, the user would simply enter FILE1 when prompted for the file name. Press <ENTER>, instead of entering a file name, if you are unsure of the data file name to be retrieved or <Esc> to return to the CASH DATA INPUT MENU. For this option, the user will see the default data path which can be changed. Then the user is prompted for the name of an input file, up to 8 characters long without any extension:

Enter path or <ENTER> for default path: c:\cash\DATA

Enter data filename, or press only <ENTER> to return

CASH DATA FILE ENTRY CHOICE 3 - Return to the MAIN MENU

With this option the user can return to the CASH Main Menu. He might for example want to read the model overview again or simply quit the session.

CASHFLOW DATA INPUT MENU Option 2 - Enter new data

This option is designed for entry of new data into CASH via the terminal keyboard. If data is to be entered from the keyboard, CASH first provides an option to enter a title that describes the project to be analyzed:

RUN TITLE INPUT SECTION

Do you want to input a title?
Yes No

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Enter up to 5 lines of text up to 60 characters long. Press <ENTER> at the end of each line
Press a key to continue...

RUN TITLE INPUT SECTION
Line 1: Analysis of a Christmas tree plantation project
Line 2: Hubbard County Minnesota
Line 3: 

The program then shows a list of default CASH run parameters:

SUMMARY OF CASH RUN PARAMETERS
1. Number of periods in cash flow: 10
2. Monetary units : dollars
3. Monetary scaling units : dollars
4. Project units : acre(s)
5. Project size : 1
6. Type of discount rate : Real
7. Number of cost activities : 1
8. Number of revenue activities : 1
9. Real discount rate : 4 percent
10. Nominal discount rate : 4 percent
11. General inflation rate : 0 percent
12. Implied real discount rate : 0 percent

Do you want to change any run parameters?
Yes No

For a "Yes" answer, the Cash Flow Run Parameter Editing Menu appears. The user simply moves the cursor to the parameter to be edited and hits the <Enter> key. The program will prompt for an appropriate input. In the case of some items this will be an additional menu. Some run parameters cannot be edited because they are calculated from other parameters. They are shown in the parameter editing menu for information purposes only. If selected for editing, the program not allow such an edit and will issue appropriate messages:
Because the program starts with a set of default values, the user does not need to enter all the run parameters via the keyboard. Only the parameters that are not acceptable are edited by the user by moving the cursor to the appropriate line and using the <Enter> key.

At this point, the user will be prompted for specific inputs on each cash flow activity, i.e., all cost and revenue activities. The program allows up to 30 different cost and 30 different revenue activities to be entered. Individual activities may occur more than once if they are entered as continuous or discontinuous period activities.

Each activity should be given an appropriate name that is no more than 12 characters in length. Activities may be inflated at a rate different than that specified above by entering an appropriate rate. This option allows the analyst to perform a real analysis and only inflate or deflate those activities that historically change at rates different from the general inflation rate. For a nominal analysis, these activities may also be changed to reflect rates different from the general inflation rate. While positive values may be specified by entering the appropriate number (i.e., 0.5), negative values must be preceded by a negative sign (i.e., -0.5). Enter 0 for no difference. The rate entered is combined automatically with the general inflation rate specified above to inflate the individual factor by the exact amount that is user input. For example, in a real analysis where the general inflation rate is implied to be 0 (zero) and the desired activity inflation rate is 1.5%, enter 1.5 for the additional interest rate. For a nominal analysis, if the general inflation rate is 2% and the desired activity inflation rate is 1.5%, enter -0.5 for the additional interest rate.

The type of occurrence for an activity is single if the activity occurs only once. The program automatically assumes that all cost activities have a negative sign associated with the cash flow and a plus sign for revenue activities. It is not necessary, therefore, to enter plus or minus signs with the cash flow entries. Continuous activities require input of the first and last period of occurrence as well as the cash flows in today’s dollars for activities that occur during continuous or consecutive periods. The program assumes that the activity occurs with the same cash flow every period between the periods specified if this option is selected. Discontinuous activities require input of the number of times that the activity occurs, and the appropriate periods of occurrence and corresponding cash flow for activities that occur during periods that are not consecutive. This option allows the user to specify different cash flows for each period that the activity occurs. The discontinuous period occurrences option may also be used to specify activity cash flows that occur in consecutive periods with varying cash flows. For any discontinuous
period cash flow activity, up to 60 occurrences are permissible over the 200 period maximum planning horizon. The user may enter the periods of occurrence in any order. The same discontinuous period activity may not occur twice within any one given period.

Cost activity 1
Name (12 character limit): Planting

Enter the additional interest rate above or below the general inflation rate. Enter 0 for no difference, use a <-> sign for negative values: 0

Type of occurrence: 1. Single
2. Continuous periods
3. Discontinuous periods

In what period does Planting occur: 1
Cost per acre of Planting in today's dollars: 125

These questions will be repeated for as many times as there are cost activities. The program will prompt for the same kind of inputs also for as many revenue activities as were requested by the user. After all data has been entered, the program does a check of all discontinuous period activities to see if two or more occurrences of the same activity occur within any one given period. If the program discovers that multiple occurrences have been entered within a period for any single activity, it automatically forces the user to make appropriate corrections through the MAIN EDITING MENU. If an error associated with a discontinuous period activity is discovered in this phase, the program will produce an appropriate screen prompt, e.g.,:

```
Cost activity 5 occurs more than once in the same period.
You must edit the activity before performing any analyses.
The program cannot be run with the data in this form.

Press a key to continue...
```

The next screen display that will automatically follow is:

```
CASH DATA EDITING MENU

1. Edit general investment data
2. Edit cost activities
3. Edit revenue activities
4. Add cost or revenue activities
5. Delete cost or revenue activities
6. No editing or editing completed
```

The user will be required at this point to fix the data problem by selecting the appropriate option from the DATA EDITING MENU. The program will not permit the user to continue with the next program step until the data problem has been fixed. When all inputs have been entered, the user has the option to save the data:

```
Do you want to save data on a file?
Yes
No
```

Enter N if you do not wish to save the input data from the current analysis. Enter Y if input data is to be saved on a disk data file. Data will be automatically saved on a specified disk drive as

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it is entered. To save input data, provide an appropriate file name that is eight characters or less in length and does not contain any periods at the following prompt:

```
Saving Cash Program Data
Enter path or <ENTER> for default path: c:\cash\DATA
> <Cash
Enter data filename, or press only <ENTER> to return
> Cash
```

File C:\ACES\OUTPUT\Cash.Dat exists.
Do you want to overwrite file.

Yes  No

To rename the entered file name, i.e., not to override an existing file, the user would enter <Y>es and be prompted for a new file name.

```
Enter data filename, or press only <ENTER> to use
default name: C:\cash\DATA\Cash.Dat
> <Cash
```

The program now will display the MAIN EDITING MENU:

```
MAIN EDITING MENU

1. View analysis data
2. Edit analysis data
3. Perform calculations
4. Return to MAIN MENU

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
```

If number of periods is edited, but results in fewer years than some of the cash flows, a warning will be issued. This checking for data consistency occurs only after leaving the parameter editing screen after entering <Esc> or <Quit>.

```
Cash Flow Run Parameters Editing Menu
Highlight the parameter you wish to edit using the arrow keys.
Press <E> to edit the parameter and <D> or <ESC> to quit.

1. Title exists  : Yes
2. Number of periods in cash flow  : 3
3. Monetary units  : dollars
4. Monetary scaling units  : dollars
5. Project units  : acre(s)
6. Project size  : 1
7. Number of cost activities  : 7
8. Number of revenue activities  : 1

There is/are 6 activity(ies) with a period of occurrence larger than the new analysis period. You must edit the activities before changing the analysis period or enter a number larger than 3

Press a key to continue...
```

The user must perform these edits before choosing the "Perform Calculations" option. If this edit is not performed the program will crash upon reading the incorrect data.
The program automatically appends an extension of .DAT onto every file that is saved. CASH checks to make sure that a data file with this specified name has not already been created on the data disk. If this file name does exist, the user has the option to rename the data file to be created or to overwrite the existing file. If the existing file is overwritten, all information previously contained in the file will be destroyed (i.e., erased).

### CURRENT DATA FILE: C:\BC7\CASHNEW\CASHDAT.DAT

**Title: Using CASH to Evaluate A Christmas Tree Planting Alternative**

- **Investment size**: 1 acre(s)
- **Monetary units**: dollars
- **Monetary scaling units**: dollars
- **Last period an activity occurs**: 10 periods
- **Real discount rate**: 5 percent

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>ACTIVITY</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(dollars)</td>
<td>(Percent)</td>
</tr>
<tr>
<td>1</td>
<td>Planting</td>
<td>1</td>
<td>484.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>Weed Control</td>
<td>1 - 2</td>
<td>30.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>Mgmt &amp; Taxes</td>
<td>1 - 9</td>
<td>60.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>Spraying</td>
<td>1 - 8</td>
<td>20.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Press any key to continue....

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>ACTIVITY</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(dollars)</td>
<td>(Percent)</td>
</tr>
<tr>
<td>5</td>
<td>Fertilize</td>
<td>3</td>
<td>10.00</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>10.00</td>
<td>0.50</td>
</tr>
<tr>
<td>6</td>
<td>Shearing</td>
<td>3</td>
<td>64.82</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>64.82</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>101.86</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>111.12</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>120.38</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>101.85</td>
<td>0.50</td>
</tr>
<tr>
<td>7</td>
<td>Clean Site</td>
<td>8</td>
<td>150.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Press any key to continue....

---

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**MAIN EDITING MENU**

1. View analysis data
2. Edit analysis data
3. Perform calculations
4. Return to MAIN MENU

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

---

**CURRENT DATA FILE: C:\BC7\CASHNEW\CASHDAT.DAT**

**Title:** Using CASH to Evaluate A Christmas Tree Planting Alternative

- **Investment size:** 1 acre(s)
- **Monetary units:** dollars
- **Monetary scaling units:** dollars
- **Last period an activity occurs:** 10 periods
- **Real discount rate:** 5 percent

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>ACTIVITY</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planting</td>
<td>1</td>
<td>484.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>Weed Control</td>
<td>1 - 2</td>
<td>30.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>Mgmt &amp; Taxes</td>
<td>1 - 9</td>
<td>60.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>Spraying</td>
<td>1 - 8</td>
<td>20.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>ACTIVITY</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Fertilize</td>
<td>3</td>
<td>10.00</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>10.00</td>
<td>0.50</td>
</tr>
<tr>
<td>6</td>
<td>Shearing</td>
<td>3</td>
<td>64.82</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>64.82</td>
<td>0.50</td>
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<td>101.86</td>
<td>0.50</td>
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<td></td>
<td>6</td>
<td>111.12</td>
<td>0.50</td>
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<td>7</td>
<td>120.38</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>101.85</td>
<td>0.50</td>
</tr>
<tr>
<td>7</td>
<td>Clean Site</td>
<td>8</td>
<td>150.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>NUMBER</th>
<th>ACTIVITY</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tree Sales</td>
<td>7</td>
<td>1605.50</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>3705.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

---

Press any key to continue....
MAIN EDITING MENU

1. View analysis data
2. Edit analysis data
3. Perform calculations
4. Return to MAIN MENU

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

If a file with the proper extension of ".DAT" is being requested that was not created by CASH, a message will appear. All CASH data files are uniquely identified when created such that it is not possible to recall other data files, despite their .DAT extension.

Illegal input file, not created by CASH. There is a format error in data file or the file is empty
You must either exit from CASH and correct the file with a line editor or use another input file for the analysis

Press a key to continue...

If a file name entered does not exist on the drive, an error message will be displayed:

No file with extension .TBL is present.
Press a key to continue...

CASHFLOW DATA INPUT MENU Option 3 - Return to MAIN MENU

This option will return user to the CASH MAIN MENU.

CASH MAIN MENU Option 6 - View Cash Files

CASH also provides an option to print reports of any previously created and saved output files (with extension *.TBL). These options are initiated as options 5 and 6 from the CASH MAIN MENU:

CASH Output File Choices

1. See the list of filenames.
2. Enter the data filename.
3. Return to the MAIN MENU.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Enter path or <ENTER> for default path: c:\cash\output\
(1) ACES.TBL  
(2) POTLOPT4.TBL  
(3) CASH.TBL  
(4) CASHN.TBL  

Select by entering a number or highlight using cursor and pressing <Enter> or Spacebar  

<table>
<thead>
<tr>
<th>Do you want to view c:\cash\output\CASH.TBL?</th>
<th>Yes</th>
<th>No</th>
<th></th>
</tr>
</thead>
</table>

CASH MAIN MENU Option 7 - Print Cash Files  

Output reports may be printed by selecting this option. This option will prompt the user for a file as under option 6 (View Cash Files) and then prompt the user as follows:  

<table>
<thead>
<tr>
<th>Do you want to print c:\cash\output\CASH.TBL?</th>
<th>Yes</th>
<th>No</th>
<th></th>
</tr>
</thead>
</table>

Turn the printer on and set it to top of the page  
Press a key to continue...  

Because the program automatically appends an extension of .TBL on to every output report file created, the user does not need to add this information. The program then displays the name of the report output file that is created. To later display or print any previously created output report, the user must select option 5 or 6 from the CASH MAIN MENU. After an output report has been produced under the OUTPUT SELECTION MENU options 1, 2, and/or 3, the program automatically returns to the OUTPUT SELECTION MENU. Other copies of the same report may be produced by selecting the appropriate option.

CASH MAIN MENU Option 8 - View CASH Graphics  

This option is used to view program output generated during a run or any output tables generated in any previous run. As stated before, CASH output tables are saved under a user specified file name or the default name "CASH.TBL". The program automatically adds the extension ".TBL" to each output file. When option 8 is selected from the main menu, the following screen appears.

CASH Graph Menu Suboption 1 : Set Paths Parameters:  

For option 1, the program will request the user to enter a path or accept a default path and then display a list of files that have a valid .TBL extension for the specified disk drive. The user can select a file by hitting the <Enter> key on a highlighted file.
CASH Graph Menu

PLOT DATA FILE ENTRY CHOICES

1. Set path parameters
2. Enter plot data filename
3. Return to CASH Main Menu

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

For option 2, the program will prompt the user for a drive letter and the name of the file.

SET FILE DRIVE PATHS

1. Current Output Path for Plot Files= c:\cash\output
2. Finished (Accept current settings)

Enter the path you wish to change
Use Arrow or Number Keys to highlight
Press Spacebar or Enter to execute

Enter new path for output files

CASH Graph Menu Suboption 2: Enter Plot Data Filename

This option lets the user choose a file for plotting:

CASH PLOT OUTPUT FILE CHOICES

1. See the list of filenames.
2. Enter the data filename.
3. Return to the MAIN MENU.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Enter path or <ENTER> for default path: c:\cash\output

(1) ACES.PLT
(2) POTLOPT4.PLT
(3) POTLOPTN.PLT
(4) POTLWTHN.PLT
(5) POTLFTTHN.PLT
(6) CHEN.PLT
(7) OTHIN.PLT
(8) OTHIN.PLT
(9) FTHIN.PLT
(10) More...

Select by entering a number or highlight using cursor and pressing <Enter> or Spacebar
When a legitimate file has been selected, the program will open the graph output selection screen which provides for 5 types of graphs. For graph options 2, 4, and 5, the user can accept the discount rate used in the cash flow or change it to another rate to analyze the impact of changing discount rates on the cash flow.

CASH Graph Menu

1. Plot Costs, Revenues, and Net Revenues
2. Plot Disc. Costs, Revenues, and Net Revenues
3. Plot Cum. Costs, Revenues, and Net Revenues
5. Plot Disc. Net Revenues against Discount Rate
6. Return to Graph Input Menu

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

After leaving the graph program, the user is returned to the CASH Graph Menu.

CASH Graph Menu Suboption 3: Return to CASH MAIN MENU

For option 3, the program will return to the CASH MAIN MENU.

CASH MAIN MENU Option 9 - Exit CASH

This option is used to exit the program, returning to the operating system. All program processing will be terminated if this option is selected.

Thank you for using CASH
If you have any questions or comments concerning the use of this program, contact:

Dr. Dietmar W. Rose
1539 12th Terrace NW
New Brighton, Minnesota 55112
Tel. (612)636-7395 or (612)624-9711
E-Mail (Internet): drose@mercury.forestry.umn.edu

Press any key to continue....

CHRISTMAS TREE EXAMPLE SAMPLE RUN
In this section, data from a Scotch pine Christmas tree planting alternative is evaluated. A real analysis with a discount rate of 5 percent was selected for this illustration. While the initial investment occurs at the beginning of period 1, the last cash flow occurs at the end of period 8 (or beginning of period 9). Therefore, the analysis is assumed to have 8 discounting periods. The acreage is assumed to lay fallow during the ninth period. CASH output reports from this analysis are shown in appendix A, Tables 1-6. All reports are displayed on a per acre basis.

There are 7 cost and 1 revenue activities in the analysis. Uncertainty exists in the cash flow estimates for spraying, fertilizer application, shearing, site clearing, and tree sale revenues. In fact, estimates for tree sale revenues are very uncertain. Particular attention should be paid to these 5 activities when reviewing sensitivity analysis output.

Table 1 in the appendix provides a summary of analysis input values as determined by CASH. These analysis inputs include: 1) investment size, 2) last period in which an activity occurs, 3) the discount rate, 4) the general inflation rate (if a nominal analysis was selected), 5) and activity name, period(s) of occurrence, current price, and the amount of real change in inflation rate for all cost and revenue activities. Each cost and revenue activity is numbered sequentially with a line drawn to separate the two activity categories. The program automatically assumes that cost activities have a negative sign associated with each cash flow and a plus sign for revenue activities. The real rate of inflationary change above or below the inflation rate specified is shown (real analyses do not consider an overall general inflation rate but do allow for incorporating separate inflation rates for individual factors that historically change at rates different from the general inflation rate).

A cash flow table is optionally printed by the program (Table 2). This table contains the necessary data to calculate the various measures of investment performance. The table is primarily a listing of the cash flow amounts for each period of the investment, listing this information five periods at a time, and incorporating inflation where appropriate. Note that the cash flow associated with the fertilization that occurs in period 3 is $10.10. This was calculated according to the following formula:

\[ a(1+i)^{n-1} \]

where: $a = \text{current price ($10.00)}$

\[ i = \text{inflation rate (0.005)} \]

\[ n = \text{period of occurrence (3; n-1 = 2)} \]

Therefore, the cash flow was calculated as $10.00 \times (1.005)^2 = 10.10$. In addition, this table presents total expenditures, total receipts, and net receipts for each year in the analysis.

Table 3 provides a profile of net present value for the investment at various discount rates. This allows the analyst to assess the effect of the discount rate employed in the analysis on NPV. For a nominal analysis, the table includes both real and nominal discount rates.

The various measures of investment performance are shown in Table 4. Using the user supplied real discount rate of 5.00 percent, the investment is calculated to have a net present value of $2,122.75/acre, an equivalent annual income of $328.44/acre, a soil expectation value of $6,568.72/acre, a benefit over costs ratio of 2.24, and a payback period of 7 periods (i.e.,
payback using discounted costs and returns occurs in period 8). The calculated values for net present value, equivalent annual income, and soil expectation value are all presented in today’s dollars, regardless of whether a real or a nominal analysis is performed. The real internal rate of return is calculated to be 26.44 percent. If a nominal analysis had been performed, the nominal internal rate of return would also have been shown. While all of these performance measures point to a financially attractive investment, sensitivity analysis data must be interpreted to evaluate the risk associated with this alternative.

Sensitivity of NPV, EAI, and SEV to a 10 percent change (increase or decrease) for each cost and revenue activity is shown in Table 5. These numbers, shown in today’s dollars, indicate the relative impact of a change in the cash flow associated with each activity. The larger the amount indicated, the greater the impact resulting from a given percentage change. Expenditure increases and/or receipt decreases have the effect of decreasing NPV, EAI, and SEV by the amounts indicated in the table (i.e., decrease investment profitability). Conversely, expenditure decreases and/or receipt increases will increase the performance measures (i.e., make the investment more profitable). Because the calculated values shown in Table 5 are in today’s dollars, the results will be the same for both real and nominal analyses.

In this example, the greatest impact on NPV, EAI, and SEV would result from changes in tree sale revenues and the smallest impact from changes in fertilization costs (Table 5). In addition to relative impacts on the investment performance measures, specific impacts can also be calculated. For example, NPV for the investment was calculated to be $2,122.75 (Table 4). If planting cost had decreased by 10 percent in today’s dollars, NPV would be $2,122.75 + $48.40 or $2,171.15. The same logic would hold true for EAI and SEV. On the other hand, if planting cost had increased by 10 percent in today’s dollars, NPV would have dropped by $48.40 to $2,074.35. Expenditure increases and/or receipt decreases of 10 percent decrease the three investment performance measures by the amounts indicated in the table. Expenditure decreases and/or receipt increases of 10 percent increase the performance measure by the same amounts.

Changes in NPV, EAI, and SEV from variations in several cost and/or revenue cash flows can also be calculated directly from Table 5. For example, a 50 percent increase in planting cost would lower NPV by five times the amount of a 10 percent planting cost increase (five times $48.40 or $242.00). Combinations of any number of changes in the cost and revenue cash flows can also be calculated. For example, if all costs were assumed to be 10 percent higher and all revenues 20 percent lower, NPV would equal: $2,122.75 - $170.84 - $766.22 = $1,185.69. In other words, even if the above changes were to occur, the overall investment decision based on NPV would remain the same since the investment would only become unattractive in a general sense when NPV equals zero.

Sometimes it is useful to know how much change is necessary in today’s dollars for one or more costs and/or receipts to change the investment decision. This information is shown in Table 6, using NPV as the economic performance measure. In this example, one might wish to know how much tree sales receipts must decrease in today’s dollars to cause NPV to equal zero. This is determined by dividing NPV (Table 4) by the corresponding change in that measure (Table 5), and then multiplying the result by .10 (the percent change specified in Table 5). Using tree sales and NPV, the result is the following:

\[
\frac{2,122.75}{383.11} = 5.541 \times 10 \text{ percent} = 55.41 \text{ percent}
\]
i.e., a decrease of 55.41 percent in today's dollars for tree sales revenues would result in a NPV of zero. If any of the individual cost estimates in this analysis increased by 100 percent, the overall investment selection would not change, given the current criteria. NPV would still be greater than $0.00 if this were to occur. Similar calculations could also be performed for EAI and SEV using information presented in Tables 4 and 5 of the appendix.

Based solely upon an assessment of economic performance measures, the decision maker may decide to implement this investment. However, sensitivity analysis indicates that the lone revenue activity, tree sales, is very sensitive to changes in the estimate of the cash flow. If any combination of factors, such as poor markets, decreased tree survival, lower prices received, etc., were to cause estimates for this cash flow to decrease by more than 55.41 percent in today's dollars, NPV would be less than zero. Before performing the analysis, it was determined that the cash flow estimate for tree sales revenues was very uncertain due to the uncertainty in future yields, prices, and markets. This information, in addition to the economic performance data output, should be noted and kept in mind when comparing this alternative to other potential investment alternatives.

By using CASH, the analyst can become better informed of the economic viability as well as the sensitivity of any investment alternative. This example has only attempted to portray some of the most important factors that must be assessed when performing investment analysis. For further information on this topic, the authors refer you to Rose and Blinn (1985).

LITERATURE CITED

### Appendix A

**Output Tables from Christmas Tree Example**

**CASH 5.1, November 1993**

Using CASH to Evaluate A Christmas Tree Planting Alternative

**ANALYSIS INPUT VALUES**
- **Investment size**: 1 acre(s)
- **Project units**: acre(s)
- **Number of periods in cash flow**: 10
- **Monetary units**: dollars
- **Monetary scaling units**: dollars
- **Last period in which an activity occurs**: 10
- **Real discount rate**: 5.00%

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>NAME</th>
<th>PERIOD(S)</th>
<th>CURRENT PRICE</th>
<th>INFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planting</td>
<td>1</td>
<td>484.00</td>
<td>0.00%</td>
</tr>
<tr>
<td>2</td>
<td>Weed Control</td>
<td>1 - 2</td>
<td>30.00</td>
<td>0.00%</td>
</tr>
<tr>
<td>3</td>
<td>Mgmt &amp; Taxes</td>
<td>1 - 9</td>
<td>60.00</td>
<td>0.00%</td>
</tr>
<tr>
<td>4</td>
<td>Spraying</td>
<td>1 - 8</td>
<td>20.00</td>
<td>0.00%</td>
</tr>
<tr>
<td>5</td>
<td>Fertilize</td>
<td>3</td>
<td>10.00</td>
<td>0.50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>10.00</td>
<td>0.50%</td>
</tr>
<tr>
<td>6</td>
<td>Shearing</td>
<td>3</td>
<td>101.86</td>
<td>0.50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>64.88</td>
<td>0.50%</td>
</tr>
<tr>
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<td>0.50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>120.38</td>
<td>0.50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>101.85</td>
<td>0.50%</td>
</tr>
<tr>
<td>7</td>
<td>Clean Site</td>
<td>8</td>
<td>150.00</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

---

**Using CASH to Evaluate A Christmas Tree Planting Alternative**

**CASH FLOW PATTERN BY PERIOD**

All values in today's dollars inflated to period of occurrence

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>ACTIVITY</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Planting</td>
<td>484.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Weed Control</td>
<td>30.00</td>
<td>30.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Mgmt &amp; Taxes</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
</tr>
<tr>
<td></td>
<td>Spraying</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
</tr>
<tr>
<td></td>
<td>Fertilize</td>
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<td>10.10</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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<td>Shearing</td>
<td>0.00</td>
<td>0.00</td>
<td>65.47</td>
<td>65.80</td>
<td>103.91</td>
</tr>
<tr>
<td></td>
<td>Clean Site</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Tot period costs</td>
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<td>110.00</td>
<td>155.57</td>
<td>145.80</td>
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<tr>
<td></td>
<td>Cum total cost</td>
<td>594.00</td>
<td>704.00</td>
<td>859.57</td>
<td>1005.37</td>
<td>1189.28</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Tot period rev.</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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<td>Cum total revenue</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>PERIOD NET REV.</td>
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<td>-110.00</td>
<td>-155.57</td>
<td>-145.80</td>
<td>-183.91</td>
</tr>
<tr>
<td></td>
<td>CUM NET REVENUE</td>
<td>-594.00</td>
<td>-704.00</td>
<td>-859.57</td>
<td>-1005.37</td>
<td>-1189.28</td>
</tr>
</tbody>
</table>

---

37
Using CASH to Evaluate A Christmas Tree Planting Alternative

CASH FLOW PATTERN BY PERIOD

All values in today’s dollars inflated to period of occurrence

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>ACTIVITY</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Planting</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Weed Control</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Mgmt &amp; Taxes</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Spraying</td>
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<td>20.00</td>
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<td>0.00</td>
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<td>113.93</td>
<td>124.04</td>
<td>105.47</td>
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<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Clean Site</td>
<td>0.00</td>
<td>0.00</td>
<td>150.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Cum total cost</td>
<td>1393.46</td>
<td>1597.49</td>
<td>1932.96</td>
<td>1992.96</td>
<td>1992.96</td>
</tr>
</tbody>
</table>

Tree Sales

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>ACTIVITY</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tot period rev.</td>
<td>0.00</td>
<td>1605.50</td>
<td>3705.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Cum total revenue</td>
<td>0.00</td>
<td>1605.50</td>
<td>5310.50</td>
<td>5310.50</td>
<td>5310.50</td>
</tr>
</tbody>
</table>

PERIOD NET REV.

| CUM NET REVENUE | -204.18 | 1401.46 | 3369.53 | -60.00 | 0.00 |

PROFILE OF NET PRESENT VALUE (NPV) FOR THE INVESTMENT AT VARIOUS DISCOUNT RATES

<table>
<thead>
<tr>
<th>REAL RATE</th>
<th>NPV dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td></td>
</tr>
<tr>
<td>0.00%</td>
<td>3317.54</td>
</tr>
<tr>
<td>2.00%</td>
<td>2783.03</td>
</tr>
<tr>
<td>4.00%</td>
<td>2326.08</td>
</tr>
<tr>
<td>6.00%</td>
<td>1934.37</td>
</tr>
<tr>
<td>8.00%</td>
<td>1597.72</td>
</tr>
<tr>
<td>10.00%</td>
<td>1307.70</td>
</tr>
<tr>
<td>12.00%</td>
<td>1057.25</td>
</tr>
<tr>
<td>14.00%</td>
<td>840.50</td>
</tr>
<tr>
<td>16.00%</td>
<td>652.53</td>
</tr>
<tr>
<td>18.00%</td>
<td>489.17</td>
</tr>
<tr>
<td>20.00%</td>
<td>346.95</td>
</tr>
<tr>
<td>22.00%</td>
<td>222.89</td>
</tr>
<tr>
<td>24.00%</td>
<td>114.51</td>
</tr>
<tr>
<td>26.00%</td>
<td>19.66</td>
</tr>
<tr>
<td>28.00%</td>
<td>-63.47</td>
</tr>
<tr>
<td>30.00%</td>
<td>-136.43</td>
</tr>
<tr>
<td>32.00%</td>
<td>-200.55</td>
</tr>
<tr>
<td>34.00%</td>
<td>-256.97</td>
</tr>
<tr>
<td>36.00%</td>
<td>-306.68</td>
</tr>
<tr>
<td>38.00%</td>
<td>-350.51</td>
</tr>
<tr>
<td>40.00%</td>
<td>-389.20</td>
</tr>
<tr>
<td>42.00%</td>
<td>-423.59</td>
</tr>
<tr>
<td>44.00%</td>
<td>-453.61</td>
</tr>
<tr>
<td>46.00%</td>
<td>-480.35</td>
</tr>
<tr>
<td>48.00%</td>
<td>-504.02</td>
</tr>
<tr>
<td>50.00%</td>
<td>-524.98</td>
</tr>
</tbody>
</table>
Using CASH to Evaluate A Christmas Tree Planting Alternative

INVESTMENT PERFORMANCE ANALYSIS

Real Discount Rate = 5.00
Last period in which an activity occurs = 10
All values in today's dollars

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Present Value (NPV)</td>
<td>$212,749</td>
</tr>
<tr>
<td>Equivalent Annual (Periodic) Income (EAI)</td>
<td>$298,65</td>
</tr>
<tr>
<td>Soil Expectation Value (SEV)</td>
<td>$5972,999</td>
</tr>
<tr>
<td>Benefit/Cost ratio</td>
<td>2.242554</td>
</tr>
<tr>
<td>Periods to pay back at discount</td>
<td>7 periods</td>
</tr>
<tr>
<td>Real internal rate of return</td>
<td>26.43999 percent</td>
</tr>
</tbody>
</table>

Soil expectation value (SEV) is the capitalized value of an infinitely long series of cash flows associated with a timber management alternative that starts with BARE LAND. While a SEV was determined from the inputted cash flows, the calculated value is not appropriate for interpretation unless period 1 was the year of planting, all timber management cash flows were incorporated for the entire rotation, and cash flows were in period 1 dollars. Land purchase costs and land sale returns must be removed from the cash flow stream before SEV is computed.

Using CASH to Evaluate A Christmas Tree Planting Alternative

SENSITIVITY ANALYSIS
(SENSITIVITY OF PERFORMANCE TO A 10% CHANGE IN INPUT VALUES)

Real Discount Rate = 5.00
Last period in which an activity occurs = 10
All monetary values are in today's dollars per acre(s)

<table>
<thead>
<tr>
<th>ACTIVITY CHANGED</th>
<th>NPV CHANGE dollars</th>
<th>EAI CHANGE dollars</th>
<th>SEV CHANGE dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting</td>
<td>48.40</td>
<td>6.81</td>
<td>136.19</td>
</tr>
<tr>
<td>Weed Control</td>
<td>5.86</td>
<td>0.82</td>
<td>16.48</td>
</tr>
<tr>
<td>Mgmt &amp; Taxes</td>
<td>44.78</td>
<td>6.30</td>
<td>126.00</td>
</tr>
<tr>
<td>Spraying</td>
<td>13.57</td>
<td>1.91</td>
<td>38.19</td>
</tr>
<tr>
<td>Fertilize</td>
<td>1.72</td>
<td>0.24</td>
<td>4.84</td>
</tr>
<tr>
<td>Shearing</td>
<td>45.85</td>
<td>6.45</td>
<td>129.01</td>
</tr>
<tr>
<td>Clean Site</td>
<td>10.66</td>
<td>1.50</td>
<td>30.00</td>
</tr>
<tr>
<td>Tree Sales</td>
<td>385.11</td>
<td>53.90</td>
<td>1078.00</td>
</tr>
</tbody>
</table>

Soil expectation value (SEV) is the capitalized value of an infinitely long series of cash flows associated with a timber management alternative that starts with BARE LAND. While a SEV sensitivity analysis was performed using inputted cash flows, the calculated values are not appropriate for interpretation unless period 1 was the year of planting, all timber management cash flows were incorporated for the entire rotation, and cash flows were in Period 1 dollars. Land purchase costs and land sale returns must be removed from the cash flow stream before SEV sensitivity analysis is computed.
Using CASM to Evaluate A Christmas Tree Planting Alternative

RISK ANALYSIS

(INPUT VALUE CHANGES WHICH WILL MAKE NPV EXACTLY EQUAL TO $0.00)

Real Discount Rate = 5.00
Nominal Discount Rate = 5.00
General Inflation Rate = 0.00
Last period in which an activity occurs = 10
All monetary values are in today's dollars per acre(s)

<table>
<thead>
<tr>
<th>ACTIVITY CHANGED</th>
<th>PERCENT CHANGE</th>
<th>MONEY UNIT CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting</td>
<td>100.00%</td>
<td>-484.00 dollars</td>
</tr>
<tr>
<td>Weed Control</td>
<td>100.00%</td>
<td>-58.57 dollars</td>
</tr>
<tr>
<td>Mgmt &amp; Taxes</td>
<td>100.00%</td>
<td>-447.79 dollars</td>
</tr>
<tr>
<td>Spraying</td>
<td>100.00%</td>
<td>-135.73 dollars</td>
</tr>
<tr>
<td>Fertilize</td>
<td>100.00%</td>
<td>-17.19 dollars</td>
</tr>
<tr>
<td>Shearing</td>
<td>100.00%</td>
<td>-458.49 dollars</td>
</tr>
<tr>
<td>Clean Site</td>
<td>100.00%</td>
<td>-106.60 dollars</td>
</tr>
</tbody>
</table>

====================================================================================================================================================================

Tree Sales                                        -55.41%                                        -2122.75

====================================================================================================================================================================

NOTE: When percent change equals 100% and dollar change is smaller than $2122.749, the input variable will not alter the overall investment selection given the current investment criteria.
Appendix B
Listing of Input File CASH.EXP for Christmas Tree Example

"CASH DATA FILE",1,"Yes"
"Using CASH to Evaluate A Christmas Tree Planting Alternative"
10,"dollars",1,"dollars",1,"acre(s)",1,1,0,5,0,0,0,7,1
"Planting",0,1
1,484
"Weed Control",0,0
1,2
30
30
"Mgmt & Taxes",0,0
1,9
60
60
60
60
60
60
60
60
60
60
60
60
60
60
"Spraying",0,0
1,8
20
20
20
20
20
20
20
20
20
20
"Fertilize",5,2
3,10
6,10
"Shearing",5,6
3,64.82
4,64.82
5,101.86
6,111.12
7,120.38
8,101.85
"Clean Site",0,1
8,150
"Tree Sales",0,2
7,1605.5
8,3705