TECHNICAL NOTE

H-OPCOST: A software package for analyzing the costs of operating a mechanical wild blueberry harvester

K. J. SIBLEY and D.L. ARSENAULT

Sibley Engineering-Division of Paige Holdings Ltd., 8 Wharf Road, Great Village, NS, Canada B0M 1L0. Received 18 September 1995; accepted 24 October 1996.

INTRODUCTION

H-OPCOST (Harvester Operating Cost) is a software program that allows the operating costs of a mechanical wild blueberry harvester to be estimated based on user-defined input variable values. It was created to aid blueberry farmers and extension workers by eliminating lengthy and/or cumbersome spreadsheet calculations. Each user can tailor the cost calculations specifically to his/her own operations to get a detailed statement of annual, per hour of operation, and per pound harvested operating costs. The software can also be used to project future operating costs for various scenarios. Cost calculations are performed using the most up-to-date generally accepted accounting principles and formulae and are adjusted for inflation to give the most accurate results possible.

SOFTWARE DESIGN

H-OPCOST was developed using Microsoft Visual Basic 3.0 for Windows. Visual Basic’s Setup Wizard was then used to create a stand alone software package that runs under the Windows 3.1 environment. Windows based development software was used to give the user a visually pleasing and easy-to-use working environment. The program is mouse and keyboard driven. Results windows can be viewed on screen by clicking on the appropriate buttons. As well, each...
The Operating Costs (Fig. 5) is a graphical presentation of the Operating Cost Matrix, showing the Operating Costs per pound versus Effective Field Capacity for a selected Harvested Yield. Various harvested yields can be selected using a drop down box and an updated graph is automatically drawn after each new selection.

Data can be entered or changed from any of the program's results viewing windows by clicking on the appropriate data entry button and entering new data in the pop-up data entry window. Figure 6 shows a sample data entry window as would appear on the screen when running the program. Closing the window then automatically initiates costs recalculation using the new data and displays the new costs in the current results viewing window. This allows easy comparisons of previous costs with the new costs resulting from the alteration of any operating variable. The data in each data entry window can also be reset to the pre-programmed default values.

H-OPCOST will run on any computer running Windows 3.1 (or later) and supporting SVGA resolution.

The user input variables built into H-OPCOST for each data entry category, along with their default values, are shown in Table I.

**COST CALCULATIONS SUMMARY**

H-OPCOST's operating statement breaks the total operating cost down into fixed, variable, and administration and overhead costs.

**Annual fixed costs**

Annual fixed costs are those associated with owning the equipment (ie. tractor and harvester). They are constant no matter how much or how little the equipment is used. H-OPCOST includes Depreciation and Interest on Investment, Insurance, and Housing in its Annual Fixed costs calculations.

Depreciation and Interest on Investment are determined using the Capital Recovery with Return Method. This method accounts for the “opportunity cost” of not being able to invest the purchasing funds of the equipment elsewhere (if purchaser uses cash-on-hand) or for the cost of borrowing the purchasing funds. It uses a real rate of interest based on the current market interest rate and the average expected inflation rate over the useful life of the equipment. Depreciation is based on industry averages of remaining value as reported in the ASAE D497.1, Agricultural Machinery Management Data (ASAE 1993). The Capital Recovery with Return
Method has been reported by Bartholomew (1981) to give the most accurate estimate of true Depreciation and Interest, especially in times of high inflation. Calculations based on the alternate Straight Line Depreciation, Interest on Average Investment Method can underestimate Depreciation and Interest costs by 15% for a market interest rate of 10% and a useful life of 20 years. Default Annual Hours of Use for the repairs and maintenance costs, and a decreased useful life. Both are determined based on the purchase price of the equipment as defined by the user. Default multiplication factors are industry averages as reported in the ASAE D497.1, Agricultural Machinery Management Data (ASAE 1993) and in the Atlantic Committee on Agricultural Engineering publication Minimum Cost of Custom Rates for Agricultural Machines (Watts 1986).

Unlike other machinery costing software, Annual Fixed costs may also be increased or decreased by a Severity of Use Factor built into H-OPCOST’s financial model. In real life, if the equipment is harshly used or not maintained properly, its useful life and remaining value can be decreased significantly. Decreasing the useful life and remaining value of the equipment increases the actual ownership costs. The converse is also true for equipment that is properly used and well cared for. In H-OPCOST, increasing the Severity of Use Factor above 1.0 decreases useful life. Decreasing it below 1.0 increases useful life. Since this is a new concept being built into a financial model, there are no background data in the literature and collecting such data was beyond the scope of this project. It is available for users to use if they feel their particular circumstances warrant. Otherwise it can be left set to its default value of 1.0 which will have no effect on the cost calculations.

**Annual variable costs**

Annual Variable costs are those associated with operating the equipment. They vary according to how much the equipment is used. H-OPCOST includes Repairs and Maintenance, Fuel, Lubrication, Hydraulic Oil, Labour, and Interest on Operating Capital in determining Annual Variable Costs.

Repairs and Maintenance costs are determined based on the annual use of the equipment and its purchase price. Default multiplication factors for Repairs and Maintenance costs are industry averages as reported in Saskatchewan Agriculture’s Farm Machinery Custom & Rental Rate Guide (Saskatchewan Agriculture 1987).

Fuel costs are determined based on the annual use of the tractor are based on industry averages as reported in Alberta Agriculture’s publication Farm Machinery Costs as a Guide to Custom Rates (Alberta Agriculture 1990). Annual Hours of Use for the harvester are based on the number of days used and the daily operating time as input by the user.

Insurance and Housing costs have been included in Annual Fixed Costs, even though some owners may not insure their equipment or may leave it outside unprotected from the weather. Inclusion of these costs gives a more realistic estimate of the true costs of owning the equipment, especially since not properly housing the equipment results in increased
### Table I: User input variables and their default values

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Purchase price</th>
<th>Annual hours of use</th>
<th>Useful life</th>
<th>Severity of use factor</th>
<th>Insurance rate factor</th>
<th>Housing cost factor</th>
<th>Repair and maintenance factor</th>
<th>Fuel use</th>
<th>Fuel price</th>
<th>Lubrication cost factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor</td>
<td>$40,000</td>
<td>600 h</td>
<td>10,000 h</td>
<td>1</td>
<td>0.4%</td>
<td>0.75%</td>
<td>0.0833 $/h/$1000 list</td>
<td>13.24 L/h</td>
<td>$0.41/L</td>
<td>15%</td>
</tr>
<tr>
<td>Harvester</td>
<td>$20,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour</td>
<td>$8/h</td>
<td>$6/h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>18 d</td>
<td>10 h</td>
<td>1 h</td>
<td>1 h</td>
<td>4.5% of wages</td>
<td>3% of wages</td>
<td>5% of total costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank</td>
<td>60 d</td>
<td>8.5%</td>
<td>1.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Interest on Operating Capital accounts for the “opportunity cost” of not being able to invest funds used during harvesting (i.e. to pay variable costs) elsewhere, if cash-on-hand is being used to float the operation of the equipment, or for the cost of borrowing funds during such time. It is determined based on the Operating Capital Repayment Period, current market Interest Rate, and Total Variable costs.

**Administration and overhead costs**

Administration and Overhead costs are determined based on a user input percentage of total Annual Fixed and Annual Variable costs.

### CONCLUSIONS

H-OPCOST gives the user the following capabilities:

1. Growers can estimate mechanical harvesting costs and negotiate the best price for having their fields custom picked.
2. Harvester owners and custom operators can use it to predict operating costs.
3. Ability to analyze labour costs versus operating costs for different levels of operating performance.
4. Ability to analyze operating costs per pound versus harvested yield.
5. Ability to analyze the implications of changing operating variables on costs.

Currently, H-OPCOST is being used by Farm Business Management and Agricultural Engineering Extension personnel in New Brunswick, PEI, and Maine, USA. Comments received from these users indicate that the software is extremely easy to use, is visually pleasing, and produces accurate cost figures.

### REFERENCES


Saskatchewan Agriculture. 1987. Farm Machinery Custom & Rental Rate Guide (Revised). Regina, SK: Saskatchewan Department of Agriculture, Economics Branch, Farm Management Section.