A PROGRAM FOR THE BASIC FORMULA METHOD FOR TREE VALUATION[1]

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Abstract. A program is presented that computes tree valuation by the basic formula method. This program is designed to support portable, hand held, battery operated programmable calculators which are suitable for use in the field. Use of this program eliminates computational error that can jeopardize the validity and practical usefuleness of tree valuation by the basic formula method.

Accurate determination of the monetary value of trees is an important yet complex facet of practical arboriculture. Formal procedures have been published to determine tree value using the replacement method and the basic formula method (2, 3). A recent critique (4) illustrated some of the strengths of the procedures and made valuable suggestions for improvement, including some that could require major reorientation of the methodology of valuation by the basic formula method. An additional area where improvements could be made, but that would not require any significant restructuring of procedures, would be to increase the accuracy and precision of the computational aspects of tree valuation.

We have noted occasional serious errors in tree valuations by the basic formula method performed by our undergraduate students in the course Landscape Practices and Arboriculture (ORH 4235). Students are required to perform tree valuations as part of the laboratory component of this course. Valuations are evaluated by comparing those made by different students on the same trees and by comparing the student valuations with those made by a Certified Landscape Appraiser. As Tate (4) points out, some aspects of tree valuation are more subjective than others, and a great deal of the variation we have observed in valuation is attributable to disagreement over subjective aspects, such as the location factor. An additional, and sometimes very serious, source of error is in the computation itself. In some cases valuations were distorted more by computational errors than by disagreement over subjective factors. To help minimize computational error in tree valuation by the basic formula method, we have developed a program for use on an inexpensive (retail cost less than $50), hand held, battery operated electronic programmable calculator. It can be used in the field and will enable the arborist to quickly and accurately complete the computational phase of valuation.

The Program

This program is written in Reverse Polish Notation (1, 5) and calculates tree valuation using the basic formula method. It requires that the user key in tree diameter, species factor, condition factor and location factor. The program internally computes basal area, basic value (the current rate of $27.00 per square inch can be adjusted by changing the entries in program lines 008 and 009), and the net value of the tree. The program presented here was written for use on the Hewlett-Packard HP-11C calculator, but with

Figure 1. The probability and ease of use of programmable calculators allow the quick and accurate determination of tree valuation in the field.

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minor transcriptional changes will work on calculators made by other manufacturers (versions of this program transcribed for the Texas Instruments TI-60, TI-66 and Hewlett-Packard HP-20S and HP-32S are available by contacting the authors).

A Sample Run. The following example takes the data presented by Neely (3): A tree with a circumference of 47 inches (diameter of 14.96 inches) at height of 4.5 feet, a species factor of 85%, condition factor of 75%, and a location factor of 80%.

1. Load the program into the calculator according to instructions on Tables 1 and 2.
2. Key in diameter breast height in inches (14.96 inches), then press the STO key, then press the 1 key.
3. Key in the species factor as a decimal fraction (0.85), then press the STO key, then press the 2 key.
4. Key in the condition factor as a decimal fraction (0.75), then press the STO key, then press the 3 key.
5. Key in the location factor as a decimal fraction (0.80), then press the STO key, then press the 4 key.
6. Press the f key, then press the A key. The word "running" will flash on the screen for a few seconds, then the net value of the tree as determined by the basic formula method will appear on the display ($2,420).

The data entered in the above example will be stored in the calculator for later retrival even if it is turned off. To compute additional tree valuations, new data can be entered and as these data are entered, they override and erase the previous data. If only one tree valuation is conducted, the program can be used for storage of the input values of diameter, species factor, condition factor and location factor. These values can be recalled by using the RCL key. Pressing RCL 1 will cause the display to indicate the diameter, RCL 2 the species factor, RCL 3 the condition factor, and RCL 4 the location factor.

Table 1. Operating directions and program listing for computing the monetary value of trees using the basic formula method, for use on a Hewlett-Packard HP-11C programmable calculator.

		Operating directions		
Step	*Instructions*	*Input data*	*Keystrokes*	*Output data*
1.	If the calculator has been programmed, go to step 4. If not, switch into program mode		g P/R	
2.	Key in the program (lines 001-017, Table 2)			
3.	Switch calculator into run mode		g P/R	
4.	Enter diameter breast height, in inches	dbh	STO 1	
5.	Enter species factor, as a decimal fraction	Species factor	STO 2	
6.	Enter condition factor, as a decimal fraction	Condition factor	STO 3	
7.	Enter location factor, as a decimal fraction	Location factor	STO 4	
8.	Execute the program		f A	Net value of tree, in dollars

Table 2. Program listing to determine tree valuation by the basic formula method using the Hewlett-Packard HP-11C programmable calculator.[2]

f LBL A	*001-*	*42, 21,*	*11*
RCL 1	*002-*	*45*	*1*
2	*003-*		*2*
÷	*004-*		*10*
g x^2	*005-*	*43*	*11*
f π	*006-*	*42*	*16*
X	*007-*		*20*
2	*008-*		*2*
7	*009-*		*7*
X	*010-*		*20*
RCL 2	*011-*	*45*	*2*
X	*012-*		*20*
RCL 3	*013-*	*45*	*3*
X	*014-*		*20*
RCL 4	*015-*	*45*	*4*
X	*016-*		*20*
g RTN	*017-*	*43*	*32*

[2]At the time this program was written, the accepted dollar value per square inch of basal area was $27.00. Values can be adjusted by changing the entries on program lines 008-009 as the need may arise.

Applications and Use

This program can be used in the field, during the tree's evaluation, eliminating the need to transport field data back to an office for computation. This allows more rapid evaluation and this can be very important, especially in situations where large numbers of trees are being evaluated. Moreover, use of this program allows more accurate and precise determinations than would otherwise be possible. Not only is the possibility of computational error minimized, but the computational precision is greatly increased. In the illustration given above, for example, the value is $2,437, when using the basic formula method in the traditional manner (3). This is due to the rounding off of numbers during the intermediate steps in the traditional manner of computation. When this program is used, the intermediate figures are not rounded off, and this results in greater measured precision in determination of tree value, since the only point at which numbers are rounded off is at the final stage in calculation.

Literature Cited

1. Anonymous. 1983. HP-11C. Owner's Handbook and Problem Solving Guide. Hewlett-Packard Corp., Corvallis Dir., Corvallis, Oregon.
2. Chadwick, L.C., T. Collins, J.C. Ferrara, E.H. Haupt, E.E. English and R.C. McConnell. 1986. Manual for plant appraisers. Council of Tree and Landscape Appraisers, Washington, D.C.
3. Neely, D. (ed.). 1988. Valuation of landscape tree, shrubs, and other plants. International Society of Arboriculture, Urbana, Illinois.
4. Tate, R. 1989. *ISA tree valuation guide: a critical examination.* J. Arboric. 15(6):145-149.
5. Wadman, T. and C. Coffin. 1984. An Easy Course in Programming the HP-11C and HP-15C. Grapevine Publications, Inc., Corvallis, Oregon.

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ABSTRACT

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In any series of grafts, some will fail to bond, or the scion will die shortly after grafting. In most species of trees, the majority of graft unions are successful, producing strong, serviceable trees. Some additional graft failure may, however, occur during the first one to three years. In a few species, the unions experience some delayed graft failure, even after the plant has reached its final location on the landscape. Nursery professionals realize that red maple grafts are highly unreliable regardless of rootstock, with as high as a 20% failure rate occurring in plants 3-6 inches in caliper or greater. Unless the tree falls over, its decline or death can easily be misdiagnosed. A debate continues in the nursery industry as to which other species are susceptible to significant delayed graft rejection. Delayed root graft rejection can also stress the tree so that it is susceptible to a host of secondary disease or insect infestations. The best procedure is to expand your specifications to include requirements for identifying rootstock. By recognizing the level of care required to avoid purchasing such plants, we can reduce the number of defective trees planted in our projects.