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# FORVAL: A computer program for FORest VALuation

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# FORVAL: A Computer Program for Forest Valuation

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FORVAL (FORest VALuation) is a computer program for cash-flow analysis of forestry investments. The FORTRAN 77 program is available from the MAFES Forestry Department for Data General computers using the Advanced Operating System with Virtual Storage, and for IBM-compatible personal computers (send letter of request and 5¼-inch diskette to P.O. Drawer FR, Mississippi State, MS 39762).

FORVAL is designed for use without a manual. Users simply answer questions displayed on the screen by the program. The following question is one of the first ones in the program; each of the options is briefly discussed below:

**What would you like to calculate?**

Enter: ***PV*** *for the following Present Value criteria—Present Net Value, Equivalent Annual Income, Benefit/Cost Ratio, and Internal Rate of Return*

***FV*** *for Future Values of costs and revenues,*

***LE*** *for Land Expectation value,*

***SF*** *for Sinking Fund amounts,*

***IP*** *for Installment Payments,*

***RC*** *for after-tax present value of Reforestation Costs, or*

***DA*** *for Depletion Allowances and after-tax timber sale income.*

The **present value (PV)** option is used for standard financial calculations. Any cash flow or forestry investment can be analyzed. The results include net present value of the cash flow at a specified interest rate, the equivalent annual income, the benefit/cost ratio, and the investment's internal rate of return. Any sort of payment series or annuity can be specified (terminating or perpetual annuities, and annual or periodic annuities).

The options will be illustrated with examples from Bullard, Monaghan, and Straka (1986). A landowner asks you to determine the net present value of regenerating 40 acres. His alternative rate of return is 4% (net of inflation, as are costs and revenues in the examples). The investment is outlined below on a per acre basis:

| Item | Year | Type of Cost/Revenue | Amount |
|---|---|---|---|
| Establishment Cost | 0 | Single Sum | $ 160.00 |
| Annual Management & Tax Cost | 1-27 | Annual | $ -2.50 |
| Thinning Revenue | 16 | Single Sum | $ 97.50 |
| Thinning Revenue | 22 | Single Sum | $ 156.00 |
| Harvest Revenue | 27 | Single Sum | $1,287.00 |

The *net present value* of this investment is $363.41 per acre. This means the investment would earn a 4% rate of return, *plus $363.41*. The *equivalent annual income* is $22.25. The investment yields a net income equivalent to an annual income of $22.25 per acre per year over the 27-year rotation. The *benefit/cost ratio* is 2.81 to 1. At 4% interest benefits exceed costs by a factor of 2.81 to 1.00. The investment has an *internal rate of return* of 8.7%.

The **future value (FV)** option allows the user to compute the value of a single cash flow at a future date, considering a real rate of increase and an expected inflation rate.

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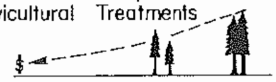
# SUMMARY
## OF FORVAL OPTIONS

### PV option

Present Net Value
Equivalent Annual Income
Benefit/Cost Ratio
Internal Rate of Return

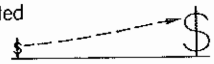
Valuation Criteria Can Be Determined For Entire Rotations Or For Specific Silvicultural Treatments



### FV option

Future Values of Cost And Revenues

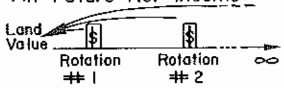
Inflationary And Real Increases In Prices And Costs Can Be Projected




### LE option

Land Expectation Value

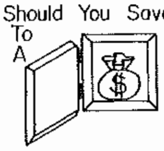
Bare Land Value For Forestry Uses Of The Land = Present Value Of All Future Net Income




### SF option

Sinking Fund Amounts

How Much Should You Save Each Year To Accumulate A Specific Amount?



### IP option

Installments Payments

How Much Are Your Monthly Payments For A House, A Car Or Other Equipment?

Loan Payments

(Annual, Quarterly, Monthly)

### RC option

Reforestation Costs

Effective Cost Of Reforestation Is The After-Tax Present Value:

Reforestation Cost
-Cost Shares
-Present Value of Tax Savings from PL 96-451

Effective Cost

### DA option

Depletion Allowances And Timber Sale Revenues After Taxes

| | |
|---|---|
| Basis for Depletion* | Timber Sale Revenue* |
| -Depletion Allowance■ for Timber Sale | -Taxes■ (After Depletion Allowance) |
| Adjusted Basis for Depletion■ | After-Tax Timber Sale Revenue■ |

* User Input
■ Program Output

A pine plantation was established 11 years ago at a cost of $120 per acre. Timber prices increased 3½% annually in real terms (net of inflation) and the pre-commercial pine plantation value increased at the same rate. Inflation averaged 6% over the same period. What value should be assigned to the pre-merchantable plantation if the owner expects a market rate of return (the real 3½% increase and the 6% inflation) for his investment? The future value option shows a year 11 value of $332.57 per acre. Foster (1986) discusses pre-commercial timber valuation problems like this.

**Land expectation value (the LE option)** is the value of bare land if put into perpetual forest production. It is often called *bare land value.* The user inputs all costs and revenues associated with a rotation of the forest, including establishment costs. Land cost is not included–land value is what the user is calculating. This option performs a fundamental calculation used in forest valuation–the value of bare land in permanent forest production.

Consider a forest tract that presently has no merchantable timber. Following reforestation, the tract will be managed on a 30-year rotation and your real cost of capital is 6%. Site preparation and regeneration will occur in year 0 at a cost of $80 per acre. Annual management costs and property taxes will be $1.50 per acre. Thinnings will occur at ages 18 and 25 and will yield 6 and 10 cords per acre. Pulpwood is worth $16 per cord. If you intend to follow the above management sequence in perpetuity and you want to earn at least 6% on your investment, how much can you afford to pay for the bare land? The LE option gives a bare land value of $156.26 per acre. This represents the maximum amount that could be paid for the land for forestry uses–if the required interest must be earned and if the timber values assumed are those actually expected for the property.

The **sinking fund (SF)** option assumes you will put money into an account at the end of each year, beginning one year from the present, and that interest is compounded annually. It answers the question: "How much must be placed into an interest-bearing account annually to have a specified sum of money in a certain number of years?"

Sinking funds often involve equipment replacement. Suppose a $220,000 tractor must be replaced in 4 years. If a 12% sinking fund is established to pay for the tractor in 4 years, how much is the annual payment into the fund? The SE option gives a value of $46,031.70.

The **installment payment (IP)** option calculates the payment that will pay off a loan in a specified period of time. This option can be used to determine mortgage payments, or automobile and other equipment payments.

Suppose you borrow $9,000 for a pickup truck and the dealer quotes you an annual percentage rate of 8.8%. What would your monthly payment be for 48 months? The IP option calculates a payment of $223.11.

The **reforestation cost (RC)** option calculates the after-tax present value of regenerating a forest tract. For a given landowner, this represents the effective cost of the reforestation investment. Savings are derived from the tax incentives of PL 96-451, and from cost-share assistance programs such as the Forest Incentives Program and Mississippi's Forest Resources Development Program. This option uses a set of assumptions that should apply to most nonindustrial private forest landowners:

(1) total reforestation expenses, after cost-sharing, are less than or equal to $10,000 in a single year,

(2) the landowner claims a 10% initial tax credit and amortizes 95% of the expense,

(3) initial tax savings are immediate for expenses toward the end of a landowner's tax year, and

(4) any cost-shares received are not included as taxable income.

This calculation gives a landowner the *effective cost of reforestation*–the cost after cost-sharing, after-taxes, and considering the time value of money.

Problems of this type are discussed in Bullard and Straka (1985). Consider a $10,000 reforestation investment at the end of the tax year by a forest farmer receiving 50% cost-sharing, with a 10% discount rate and a 28% marginal tax rate. The forest farmer can amortize over 7 years; i.e., he can write off his expenses over 7 years. Thus, he reduces his taxes over the next 7 years. Also, he receives a 10% tax credit. The RC option shows that the forest farmer's effective cost of reforestation (after cost-sharing, after tax savings, and after the investment tax credit) is $3,528.75.

The **DA option reports the depletion allowance,** the adjusted basis for depletion, and the after-tax value of the revenue from a timber sale. The user inputs the percentage of standing timber removed, the timber revenue generated, the landowner's marginal tax rate, and the current basis for depletion. Upon request, the program will output the detailed calculations used to derive the depletion allowance.

Consider a timber sale that produces $200,000 of revenue. The timber owner has a marginal tax rate of 28%. The basis of the timber is $80,000. Half of the timber was removed from the tract. The DA option shows that the after-tax value of the timber sale revenue is $155,200 and the adjusted basis for depletion is now $40,000.

FORVAL performs standard forest valuation calculations. It has both operational and instructional uses. If detailed instructions are requested, for example, all calculations are explained. For operational use, one of the questions early in the program allows you to choose abbreviated instructions.

## Literature Cited


Bullard, S. H., T. A. Monaghan, and T. J. Straka. 1986. Introduction to forest valuation and investment analysis. Mississippi Coop. Ext. Serv. Publ. 1546. 131 p.

Bullard, S. H., and T. J. Straka. 1985. What is your "effective" rate of reforestation cost? Forest Farmer 45(1):16-17.

Foster, B. B. 1986. An alternative method for evaluating precommercial timber. The Consultant 31(2):29-32.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