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Forestry and natural resources investment analysis via computer software

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A new software package that allows for the valuation of forestry and natural resources investments and projects, has been announced by US-based researchers.

The valuation of forestry and natural resources investments and projects often present challenging analysis problems that require the use of computer software. Obtaining useful results from such packages are often difficult due to complex user/program interfaces, while most are also subscriber-based and not freely available.

Two US-based researchers have announced the availability of a new valuation package, known as FORVAL (FORest VALuation). According to its inceptors, it provides for a user-friendly, menu-driven, agricultural and natural resources investment analysis package that can either be downloaded or used online, free of charge.

The authors of FORVAL are both recognised experts in forest valuation. Tom Straka is a professor of forest management/economics at Clemson University in South Carolina while Steve Bullard is dean of the Stephen F. Austin State University College of Forestry and Agriculture at Nacogdoches in Texas.

Originally designed for forestry applications, the package has since then evolved to also allow for the analysis of agricultural and natural resources investments. Users simply respond to questions displayed on the computer screen.

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Shosholoza Contractors – forward to stellar performance

Roughly 360 ton is harvested on an average daily basis, that made up of primarily pine, gum and wattle utilised for pulp purposes.

Once felled, trees are debranched and stacked for mechanical loading, all of this done in-forest with final extraction to mill occurring thereafter.

Quizzed on what presented the biggest challenge when the business was started, Nkosi responded that poor internal communication, accountability and a lack of teamwork, and played a role in performance not being up to standard served to disrupt working relationships.

Measures put in place to streamline this, have resolved all of the major operational constraints, Nkosi being quick to point out that the support received from Mondi Forests proved to be invaluable, as were the inputs from the South African Forest Contractors Association (Safca)and the National Productivity Institute (NPI).

"The general business support received from Mondi, together with specific interventions and assistance provided, proved to be invaluable during the Shosholoza's first days," says Nkosi. Making sense of inconsistent safety standards also posed challenges and so too managing the company's cashflow to ensure its day-to-day activities while also not imposing on the targets set for future revenues.

Developing management skills and understanding business were also major challenges to management. In 2005 Shosholoza management took the decision that the conventional means to manage an enterprise such as Shosholoza were not adequate which saw Safca and the NPI being roped in to provide assistance.

As a result of these interventions, Shosholoza's planning, financial management and performance management improved with Shosholoza and they are now able to plan for future expansion.

Advice to budding entrepreneurs

Bongani Nkosi has much advice to offer on what prospective forestry industry entrepreneurs should focus on when starting own businesses.

"Take the time to understand the forestry jargon, learn the craft," says Nkosi. "Also identify personal goals and match that to personal commitment and accountability. Those are vital elements that ensure the survival of the business," he says.

Finally he says, "skills and knowledge is power, but don't expect that to drop from the sky. Take the initiative to get involved in courses provided by relevant institutions like for instance Safca. Not only does it provide the skills necessary to start the business, it also fosters personal growth to further enable future sustainability."

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Using FORVAL

It's useful to note that although FORVAL expresses monetary value in dollars, its authors are confident that it will not limit its usefulness in valuation calculations across other monetary units such as Rand. All valuations are calculated independently of which currency is used. The user can choose from four options: financial criteria, monthly or annual payments, pre-commercial timber value and projected stumpages price.

Financial criteria

This option is used for standard financial calculations. The following options are available:

- Net present value (discounted value of all revenues less the discounted value of all costs)
- Rate of return (the interest rate that makes the net present value equal to zero, or the rate of return actually earned by the investment)
- Equal annual income (the annual sum of money that is equivalent to a project's net present value)
- Benefit/cost ratio (indicates relationship between discounted benefits and costs)
- All of the above (calculates all the criteria mentioned above simultaneously)
- Land expectation value (the value of bare land in perpetual forest production, a specialised forestry calculation)
- Future value (the value of a single cash flow at a future date)

FORVAL uses the standard assumption that all cash flows occur at the end of the year. An exception is Year 0, which represents now or today. Sometimes site preparation or planting costs occur immediately and this equates to Year 0.

Monthly or annual payments

Besides basic single sum payments or revenues (a single cost or revenue that occurs just once during the life of an investment), three types of payments series or annuities may be specified by the user:

- Terminating annual series (Cost/revenue that occurs annually for a set period of time, eg annual property taxes over a 30-year period.)
- Perpetual annual series (Cost/revenue across an undetermined period, eg property taxes payable forever)
- Perpetual periodic series (Cost/revenue that occurs periodically for an infinite period of time, eg timber harvest revenues every 30 years forever)

To illustrate the use of financial criteria, it is assumed that a hypothetical forest owner requires the determination of the net present value of regenerating 40 ha of land. His alternative rate of return is 4% (interest rate net of inflation). Costs and revenues are also in real terms (net of inflation). The landowner also wants to know how much an investment in a 30-year rotation of pine trees will pay.

The investment is outlined in Table 1.

Item	Year incurred	Type of cost or revenue	Amount (Dollars)	Discounted value
Establishment cost	0	Single sum	-$400,00	-$400,00
Annual management and tax cost	1 – 30	Terminating annual	-10,00	-172,92
Thinning revenue	16	Single sum	+250,00	+133,47
Thinning revenue	23	Single sum	+440,00	+178,52
Harvest revenue	30	Single sum	+3 300,00	+1 017,45
				Net present value = $756,52

Table 1: *Cash flow from a typical forestry investment and calculation of net present value at a 4% interest rate (per hectare)*

The user specifies the net present value option. The program allows costs and revenues to be entered and then performs the calculation when prompted.

The first item is for establishment cost. The user inputs Year 0, single sum, and $400 as a cost. Year 0 implies planting occurring today. If preparation of the site is extended over a year, the cost will be allocated to Year 1.

The second cost is for annual management and taxes. The user inputs terminating annual series that begins in Year 1 and ends in Year 30 for an amount of $10,00.

The next three items are revenues in Years 16, 23 and 30 for $250, $440 and $3 300 respectively. The first two revenues are for thinning and the last one represents a final harvest at Year 30. Each item is entered as a revenue with computer prompts for necessary data.

Figure 1 illustrates the interactive web page used for calculations by FORVAL-online.

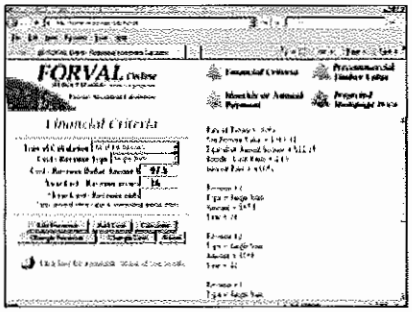


Figure 1: Example of an interactive web page used for calculation by FORVAL-online

The net present value option provides a value of $756,52 per hectare. The right-hand column of Table 1 illustrates the calculation of the $756,52. This means the investment would earn a 4% rate of return, plus an additional $756,52 in today's dollars. The rate of return option gives a value of 7,67%. If this is recalculated using a 7,67% interest rate, net present value becomes $0,34 or nearly zero as expected.

Equivalent annual income is the annual income equivalent to a specified net present value at a specified interest rate and is calculated as $43,75/ha. It is popular in forestry investment analysis for comparing timberland investments (that run many

years) with annual income from other land uses such as pasture rent or agricultural crops. Net present value is calculated as $756,52 in Table 1. Using the standard annual payments formula we can determine that 30 annual payments at 4% interest equivalent to $756,52 today are $43,75. This answers the question of how does a 30-year timberland investment compare with renting the land for pasture on an annual basis over the same period?

At 4% interest the payment must be at least $43,75 per hectare. At 4%, a landowner should no difference between a single payment of $756,52 today or 30 annual payments of $43,75. The values are equivalent.

The benefit/cost ratio of an investment is the total present value of revenues divided by the total present value of costs. An acceptable investment will have a benefit/cost ratio greater than one. In that case the present value of revenues exceeds the present value of costs. This ratio is most commonly used by public or governmental agencies. FORVAL provides a benefit/cost ratio of 2,32.

Table 1 shows discounted revenues are $1 394,42 and discounted costs are $572,92. Division shows that 2,32 is in fact correct.

There is also a future value option included to allow for the quick calculation of the future value of a single sum. The only inputs necessary are amount, interest rate, and number of compounding periods.

Land expectation value

Land expectation value (LEV) is the value of bare land if put into permanent forest production also called soil expectation value or bare land value. All costs and revenues associated with a single rotation of the forest, including establishment costs are loaded. This option performs a fundamental calculation used in forest valuation: the value of bare land in permanent forest production.

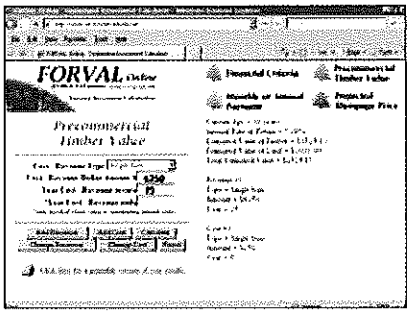
Item	Year incurred	Amount (Dollars)	Compounded value
Establishment cost	0	-$400,00	-$1 297,36
Annual management and tax cost	1-30	-10,00	-560,85
Thinning revenue	16	+250,00	+432,92
Thinning revenue	23	+440,00	+579,01
Harvest revenue	30	+3 300,00	+3 300,00
			Net future value = $2,453.72

$$LEV = \$2\,453,72/[(1,04)^{30} - 1] = \$1\,093,75$$

Table 2: *Cash flow from a typical forestry investment and calculation of land expectation volue at a 4% interest rate (per hectare)*

Firstly, the values of all costs and revenues are identical for all future rotations. All costs and revenues are compounded to the end of the rotation to get the future value of one rotation. If "t" equals the rotation length in years, then this "net future value" will be compounded amount received every "t" years.

Secondly, the land will be forested in perpetuity. Thirdly, the land requires regeneration at the beginning of the rotation (it is bare land). Fourthly, land value does not enter into the calculation. Land value is what is being calculated.



Example of interactive web page for pre-commercial timber value calculation

The LEV calculation involves compounding all costs and revenues to the end of the rotation to obtain a "net future value". This net future value is assumed to occur at the end of every rotation to form a perpetual series.

The data from Table 1 is used in Table 2 to illustrate the calculation. Note land cost was not included in Table 1 and the 4% interest rate is real (net of inflation).

Land expectation value is $1 093,75/ha. This represents the maximum amount that could be paid for bare land for timber production purposes if the required interest rate of return was 4%.

Other options

Three further options provided by FORVAL warrants mentioning: The programme can alculate the amount of a monthly or annual payment to repay an installment loan (capital recovery) or to accumulate a future sum of money (sinking fund). Inversely, it also allows for the calculation of the repayment amounts due over time to service an amount borrowed.

Another option, Pre-commercial Timber Value, calculates the value of a stand of immature timber using the current age of the trees. The calculation discounts the future stand value using the rate of return earned by the timber rotation as the discount rate. Land opportunity cost is included in the calculation (annual land rent).

The projected stumpage price option calculates the future value of any commodity price. The calculation is performed using the present price, the number of years projected, and the compounded annual rate of price increase. The underlying formula is the future value of a single sum.

Conclusion

A note from the authors of FORVAL is that it was designed for instructional purposes and as such was purposefully designed to be simple and easy to use. A second factor that mitigates in its favour in addition to it being free, is that the authors managed to avoid the temptation to modify and update it periodically. This would require upgrades, with continuing need for detailed instruction. FORVAL remains a simple model and will stay that way.

Download the program at http://fwrc.msstate.edu/software/forval.htm. A 14-page user's manual with examples is also available from the site. An online version is available for immediate use at http://www.cfr.msstate.edu/forval.