Thinning Your Woodlot: Selecting Trees for Firewood and Sawtimber by Estimating Tree Value - presented by Neil Lamson, VT Dept. of Forests, Parks and Recreation, 103 South Main St., Waterbury, VT 05671-0601. (802) 241-4453

Author: Arlyn W. Perkey, Northeastern Area, State and Private Forestry, USDA Forest Service, Morgantown, WV

Investing in timber crop trees can be financially rewarding if prospective investors understand the business. The following analysis of rates of return and crop tree income shows some favorable measures for timber crop tree investments. However, there are also some factors that hinder investment in timber crop trees on the private, non-industrial forest. An awareness of the following investment deterrents can help you, your forester, and investment counselor make more informed decisions.

1. Age of landowners

The period of investment is long relative to human life span. Many people are often at least 40 years old before they become landowners. An 11" dbh tree that grows three inches per decade will require three decades to reach 20" dbh. Many landowners would be rather mature themselves before they could receive the financial benefit from such a tree.

2. Period of investment

Some of the periods of investment are too long (more than 30 years) to be attractive if the compound interest formula is used as the means of measurement.

3. Few high-value crop trees in stands

Most stands don't have a large number of potentially high-value crop trees per acre. For example, at the Coopers Rock Crop Tree Demonstration Area in Morgantown, WV, the treatment areas that received a crown-touching release had fewer than five red oak timber crop trees per acre.

4. High-value stands are often only a small portion of the property

Most properties that are available for purchase don't have a large portion of the land covered with a high-value timber component. It often isn't feasible to acquire just the desirable portions of the property. The seller usually wants to sell the whole parcel. If it is subdivided, the cost of subdivision increases the cost of the investment.

5. Market value of immature timber not reflected in current value of property

The current market value for land and timber often does not reflect the potential future value of high-quality crop trees. If the land is sold prior to maturity of the crop trees, it is difficult to have a fair price for the immature timber reflected in the market price of the land and timber. The non-liquidity of the investment is a disincentive for many people. However, this may be a good opportunity for investors who are in a position to wait until the trees mature.

6. Investments are risky

High-value timber crop tree investments are risky. Examples of risk include changes in the market and catastrophic loss caused by insects (gypsy moth) or weather events.

7. Awareness of investment opportunities and how to achieve them

Many landowners and potential landowners are unaware of the favorable investment opportunities that do exist for timber crop trees. People who own potentially valuable timber crop trees are often not aware of the management activities that can be used to help those crop trees reach their full financial potential.

Crop tree income and rate of return can be used to improve landowners' awareness of timber crop tree investment opportunities. Below is a listing of the incomes and rates of return for 15 timber crop trees in West Virginia. The diameter growth information is based on 10 years of measured growth between 1982 and 1992.

Values are based on a stumpage rate of $75/MBF for trees 11.0 - 13.9" dbh, $150/MBF for trees 14.0 - 16.9" dbh, $225/MBF for trees 17.0 - 19.9" dbh, and $275/MBF for trees 20"+ dbh. The free-to-grow rating is determined by evaluating how free the crop tree crown is from competing neighboring trees. Possible ratings are 0, 1, 2, 3, or 4. A rating of "0" means there is no growing space available to the crop tree for crown expansion. Conversely, a rating of "4" means that the crown of the crop tree is free from competition on all four of its sides.

Income & Rates of Return for 15 WV Timber Crop Trees

Tree No.	DBH (inches)	Free to Grow (# sides)	10-Year Growth (inches)	1982 Value ($)	1992 Value ($)	Crop Tree Income ($)	Rate of Return (%)
1	20.9"	3	4.4"	$88.37	$126.50	$38.13	3.7%
2	17.1	2	3.4	37.35	66.83	29.48	6.0
3	14.3	2	2.4	16.87	30.53	13.66	6.1
4	15.3	2	1.9	25.92	48.38	22.46	6.4
5	17.8	2	4.3	63.03	119.63	56.60	6.6
6	15.2	2	3.0	20.05	41.85	21.80	7.6
7	11.1	1	1.7	2.31	4.88	2.57	7.8
8	11.2	2	2.4	2.34	5.48	3.14	8.9
9	14.2	2	3.6	16.65	51.75	35.10	12.0
10	14.0	2	4.2	16.21	53.78	37.57	12.7
11	13.7	0	1.9	7.80	26.85	19.05	13.2
12	12.0	0	2.0	4.36	16.20	11.84	14.0
13	12.2	4	3.8	4.49	28.20	23.71	20.2
14	11.1	3	2.7	2.31	15.75	13.44	21.2
15	13.2	3	4.2	5.17	49.47	44.30	25.3
Avg.	14.2	2	3.1	$20.88	$45.74	$24.86	11.4%

Rates of return and crop tree incomes are influenced by the growth rate of the crop trees and the stumpage prices, grading system, and tree scale used. The information in the above table was calculated using the previously mentioned stumpage prices, the Forest Service Log Grading System, and the International 1/4-Inch Tree Scale. These factors affect the rate of value change of the tree and the amount of income produced during a period of time. The Doyle Tree Scale is not recommended for use because it exaggerates the benefit of retaining the crop trees for a longer time period until they reach a larger diameter.

The incomes and rates of return listed in the chart do not reflect any allowance for inflation or any real increase or decrease in stumpage value that may occur. Nor do they reflect any cost of owning the land, including purchase price, taxes, and administrative expenses.

Notice that Tree Number 1 is earning good income, but its rate of return is relatively low even though it has a high free-to-grow rating and a rapid rate of physical growth. This is because the tree is already large, and it has a high initial value.

Had a crown-touching release been applied to the highest value timber crop trees in this stand, more trees would have free-to-grow ratings of 3 or 4 with corresponding growth rates, crop tree incomes, and rates of return. Crop Tree Management can facilitate development of more trees with this high productive capacity.

The most difficult part of the investment analysis procedure (and the greatest potential for error) is estimating crop tree growth. Use the instructions described on the **Crop Tree Growth** sheet found in the back pocket of this publication to obtain reliable growth data.

Knowing the past growth rate of individual trees provides a good basis for estimating how they will grow in the future.

Following is an example of how the rate of return and crop tree income is calculated for an individual tree. Using Tree Number 11 (Page 3) as an example, work through the steps listed to see for yourself how the process works.

Step 1 - Using a calculator with business analyst features, calculate the initial volume of the tree, using the following formulas:

Trees 11.0-14.9" dbh	Trees 15.0-19.9" dbh	Trees 20.0"+ dbh
$V = .16D2H + D$	$V = .16D2H + 1.5D$	$V = .16D2H + 2D$

Where V = volume in board feet (Int. 1/4"), D = dbh in inches, and H = height in 8-foot bolts.

Tree Number 11 is presently 13.7 inches dbh, and its sawlog height is three 8-foot bolts. Consequently, its initial volume is:

$V = (.16 \times 13.7 \times 13.7 \times 3) + 13.7 = 103.79$ or 104 BF

Step 2 - Calculate the initial value of the tree by multiplying the volume by the stumpage value of $0.075/BF (initial value = .075 x 104 = $ 7.80). Enter this in the present value register of the calculator.

Step 3 - Calculate the subsequent volume of the tree, using its subsequent diameter and height. In this case, subsequent diameter is 15.6" (initial dbh + 10-Year Growth) and subsequent height is four 8-foot bolts (its merchantable height increased one bolt during the 10-year period). Its subsequent volume is:

$$V = (.16 \times 15.6 \times 15.6 \times 4) + (1.5 \times 15.6) = 179.15 \text{ or } 179 \text{ BF}$$

Step 4 - Calculate the subsequent value of the tree by multiplying its volume by its stumpage value of $0.15/BF (subsequent value = .15 x 179 = $26.85). The increase in unit stumpage value is because of the increased board foot value of larger trees. Enter this in the future value register of the calculator.

Step 5 - Enter 10 (for 10 years) into the time period register, and have the calculator compute the interest rate. For this example, it is 13.2%. To obtain the crop tree income, subtract the present value from the future value -- in this case it is $19.05.

If you want to estimate the financial benefit of fully releasing crop trees, repeat the procedure with estimated accelerated growth rates. For the tree used in the example, it would not be unreasonable to increase its growth from 1.9 to 3.5 inches/decade. If there is no change in sawlog height, its rate of return would increase to 20.0%, and its crop tree income to $40.60.