Background

Pre-commercial or immature timber does not hold immediate stumpage value but it has future potential for conversion into timber products. Therefore, appraisal of immature timber stand needs a cautious analysis. From an investor standpoint, immature timberland contains two types of property: a) timber—generally harvested at rotation age, and b) land—with a perpetual ownership. Value of pre-commercial timber changes annually and progresses towards a mature stand. Therefore, the following method should be used to estimate the value of an immature stand:

\[ V_m = \frac{NV_t + LEV}{(1+i)^{t-m}} - LEV \]  

Where \( V_m \) = Value of \( m \) aged immature timber stand, \( m \) = Age of immature stand, \( t \) = Rotation age, \( NV \) = Net value of income and costs associated with immature stand between year \( m \) and rotation age (\( t \)), and \( LEV \) = Land expectation value.

As clear from above, we need to know the value of bare land, the Land Expectation Value (LEV). LEV is simply a Net Present Value (NPV) but it keeps into mind the perpetual nature of timber rotations. The following formula should be used to calculate LEV of forest stand:

\[ LEV = \frac{NFV}{(1+i)^{t-1}} \]

Where \( NFV \) = Net future value of one timber rotation. A few things are worth noting in the first formula. In the first part, we sum the value of timber between current age and rotation age of the stand (\( NV_t \)) with the value of land (LEV), and discount the summed amount (\( NV_t + LEV \)) to the current age of the stand. This provides the value of land and timber. Now, when LEV is subtracted from this sum, we are left the value of the immature stand, which is what we are looking for.

We can use the above equations to obtain the value of an immature stand in three easy steps. Following is an example that will clarify the use of the equations.

Example

A 30 year rotation (\( t \)) is prescribed for a loblolly pine forest in East Texas at the real interest rate of 4.5% (\( i = 0.045 \)). Site preparation and regeneration cost is $250/acre at the beginning. Annual management cost will be $2 per acre. First and second commercial harvesting at year 15 and 24 will generate revenue of $98/acre and $170/acre, respectively. Clear-cut at year 30 will generate $929/acre. If you want to sell stand at age 14, what should be the value of this immature stand?
Three step approach

First step: Calculate LEV

<table>
<thead>
<tr>
<th>Year (Y)</th>
<th>Item</th>
<th>Amount/acre ($)</th>
<th>Compounding formula</th>
<th>Future value ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Site prep+ tree planting</td>
<td>250</td>
<td>$250(1+0.045)^{30}$</td>
<td>-936.33</td>
</tr>
<tr>
<td>15</td>
<td>First thinning</td>
<td>98</td>
<td>$98(1+0.045)^{30-15}$</td>
<td>189.66</td>
</tr>
<tr>
<td>24</td>
<td>Second thinning</td>
<td>170</td>
<td>$170(1+0.045)^{30-24}$</td>
<td>221.38</td>
</tr>
<tr>
<td>30</td>
<td>Final harvest</td>
<td>929</td>
<td>$929(1+0.045)^{30-30}$</td>
<td>929.00</td>
</tr>
<tr>
<td>1--30</td>
<td>Annual cost</td>
<td>2</td>
<td>$2\left{\left[\left(1+0.045\right)^{30}-1\right]/0.045\right}$</td>
<td>-122.01</td>
</tr>
</tbody>
</table>

Net Future Value (NFV) 281.70
Land Expectation Value (use formula 2) 102.61

Second step: Calculate rotation age value

<table>
<thead>
<tr>
<th>Year (Y)</th>
<th>Item</th>
<th>Amount/acre ($)</th>
<th>Compounding formula</th>
<th>Future value ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>First thinning</td>
<td>98</td>
<td>$98(1+0.045)^{30-15}$</td>
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<td>$170(1+0.045)^{30-24}$</td>
<td>221.38</td>
</tr>
<tr>
<td>30</td>
<td>Final harvest</td>
<td>929</td>
<td>$929(1+0.045)^{30-30}$</td>
<td>929.00</td>
</tr>
<tr>
<td>14--30</td>
<td>Annual cost</td>
<td>2</td>
<td>$2\left{\left[\left(1+0.045\right)^{30-14}-1\right]/0.045\right}$</td>
<td>-45.44</td>
</tr>
</tbody>
</table>

Obtain Net Value (NVₜ) at rotation age by summing all items. 1294.60

Third step: Obtain results

Plug LEV and Net Value (NVₜ) in equation 1 (first page) and obtain the value of immature stand (Vₘ). In above example, value of immature timberstand is (Vₘ)=$588.27.

You can use the Timberland Decision Support System (tfsfrd.tamu.edu/tdss) for most of these estimates. A very simple calculation, in the end, provides the value of the immature stand. Please see next pages (3-5) to know more.


For questions and comments, please contact Dr. Omkar Joshi (ojoshi@tfs.tamu.edu), Forest Economist, Texas A&M Forest Service.
Step 1: Open Timberland Investment Calculator.

Run and obtain the value of bare land (LEV). It should be $102.61 (see below):
**Step 2:** Exit and reopen Timberland Investment Calculator. Since the immature stand is already 14 years old, rotation age (30-14=16) and cash flow year need to be revised.

Run and obtain the net future value at rotation age. It should be $1294.60 (see below). Ignore other estimates.
**Step 3:** Sum values from Step 1 and 2\((1294.60+102.61=1397.21)\), exit and open Compound Interest Calculator.

![Compound Interest Calculator](image)

Run and obtain the present value of immature stand and land. It will be $690.88 (see below).

![TIMBERLAND DECISION SUPPORT SYSTEM](image)

**Present value of immature stand** = Present value of stand and land - present value of land (i.e. 
$690.88-102.61=588.27$).