

## Economics of Producing an Acre of White Pine Christmas Trees

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Growing Christmas trees is an enterprise that has wide appeal as a land management alternative for many landowners in Virginia. Growing Christmas trees, however, is a moderately long-term investment that is time-consuming and laborintensive. A successful plantation requires a full commitment by the landowner and constant attention to culturing the trees. It also is fairly risky, with unpredictable potential for damage from insects, disease, weather, animals, weeds, and mancaused accidents.

What kind of returns can be expected from an investment in growing Christmas trees? The following is an example of costs and returns that could be expected from growing one acre of white pine Christmas trees in Virginia. The data were obtained by the Virginia Department of Forestry in a 1989 survey of 15 experienced Christmas tree growers in Virginia. This survey included a wide variety of growers, from small, part-time operations to large commercial enterprises. The costs and returns used in this report are

typical of Virginia conditions, but are unlikely to ideally match any single operation. The economic analysis is for information only, and does not represent any individual grower or conditions in any specific county.

### Assumptions

In order to conduct any economic analysis, it is necessary to make many assumptions about the nature of the enterprise, how cultural practices are conducted, how trees are marketed, etc. These assumptions, of course, greatly affect the results of the analysis. Labor costs vary widely from location to location, so it is unlikely that the costs used here will exactly fit the conditions in any given county. Furthermore, the data used in this report were based on average site conditions. There is evidence that production costs and returns may be higher on better quality sites and lower on poorer quality sites. These assumed costs and returns are presented in Table 1.

**Table 1. Estimated costs and returns from growing one acre of white pine Christmas trees in Virginia.**

Activity/Supply	Rotation Year										
	1	2	3	4	5	6	7	8	9	10	
Site Preparation	50	--	--	--	--	--	--	--	--	--	
Seedlings	88	13	--	--	--	--	--	--	--	--	
Planting	73	16	--	--	--	--	--	--	--	--	
Herbicides & Application	65	20	65	20	65	20	--	--	--	--	
Basal Pruning	--	--	--	43	--	--	--	--	--	--	
Insecticides & Application	--	--	36	34	198	33	180	36	128	77	
Mowing	75	75	75	75	50	50	50	50	50	50	
Shearing	--	--	45	60	124	157	173	175	150	99	
Selection & Coloring	--	--	--	--	--	--	94	150	150	94	
Harvesting	--	--	--	--	--	--	138	220	220	138	
TOTAL COST	\$4047	351	124	221	232	437	260	635	631	698	458
REVENUE	\$6826	--	--	--	--	--	--	1313	2100	2100	1313

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The following specific assumptions were made for the financial analysis reported here:

1. **Land:** The land is owned outright by the grower, and taxes are paid. Land costs and taxes can greatly influence the investment analysis, and should certainly be included if one is considering purchasing land for the purpose of growing Christmas trees. We assume this land is open, recently abandoned farmland with gently rolling topography and average fertility.
2. **Labor:** Labor costs are estimated at \$5 per hour, for part-time, temporary workers.
3. **Site Preparation:** Site preparation includes clearing the area from existing vegetation, rocks, stumps, and debris. This operation varies greatly from field to field, but generally averages \$50 per acre.
4. **Seedlings:** White pine seedlings were assumed to be purchased from the Virginia Department of Forestry at a cost of \$85/ 1,000 seedlings (2-0 stock).
5. **Planting:** Seedlings were planted on a 6 x 7 foot spacing, resulting in 1,037 trees per acre, with an average planting cost of \$70/ 1,000 trees. Actual planting costs range from \$50/1,000 seedlings to \$155/1,000 seedlings, depending upon many factors such as terrain, soil conditions, complexity of the plantation layout, etc.
6. **Replanting:** The first year survival is assumed to be 85%, which requires 156 replacement seedlings per acre, to be hand planted in Year 2. The cost of replacement planting averages \$100/1,000 seedlings, plus \$85/1,000 seedlings for replacements. Actual costs for replacement planting range from \$80 to \$300 per 1,000 seedlings. Overall plantation survival, following replanting, is assumed to be 90%.
7. **Chemical Weed Control:** Herbicides were applied for maintenance weed control annually. A contract labor rate (including equipment) of \$10/hour was used. In Years 16, atrazine was applied in two-foot bands along the rows at a total cost of \$20/acre. In addition, glyphosate was band-applied in Years 1, 3, and 5 at a total cost of \$45/acre.
8. **Mowing:** Plantation was mowed three times per year during Years 1-4, and twice per year thereafter. Contract mowing costs range from \$20 to \$40 per acre per mowing, but average \$25.

9. **Pest Control:** Pest control costs vary greatly depending upon location and outbreak levels of insects, diseases, and other pests. The three most common pests for white pines are aphids, white pine weevils, and pales weevils (which also transmit the deadly Procerum root disease). For these pests, the following control assumptions were made: Aphids -application of malathion in years 5,7, 9, and 10 at a cost of \$0.20 per tree. White pine weevils -- application of lindane in years 3-10 at a cost of \$0.04 per tree. Pales weevil -application of lindane to all cut stumps at a cost of \$0.04 per tree.
10. **Basal Pruning:** All trees are base pruned in Year 4 at a cost of \$50/ 1,000 trees. Costs for this activity range from \$40 to \$80/1,000 trees.
11. **Shearing:** All trees were sheared from Years 3-10. Costs were based on contract shearing rates, and varied according to tree size and number of trees. The following costs were assumed:

<b>Shearing Costs</b>				
<b>Year</b>	<b>No. Trees/ ac</b>	<b>Average Tree Height (ft.)</b>	<b>Cost (\$/1000 trees)</b>	<b>Actual Cost (\$/ acre)</b>
3	900	3	50.00	45.00
4	850	3-4	70.00	59.50
5	825	3-5	150.00	123.75
6	825	4-6	190.00	156.75
7	825	5-7	210.00	173.25
8	700	6-8	250.00	175.00
9	500	7-9	300.00	150.00
10	300	7-10	330.00	99.00

12. **Selection and Coloring:** The application of colorants is rapidly becoming a standard cultural practice in Virginia. Application is made only in the harvest year. Grower costs range from \$0.13 to \$1.50 per tree, but average \$0.75 per tree.
13. **Harvesting:** The harvesting operation includes chainsaw cutting, baling, transporting to the loading area, and loading on the truck. These costs are assumed as follows:

Activity	Cost (\$/tree)
Cutting	0.20
Transport to Loading Area	0.25
Baling	0.50
Loading	0.15
TOTAL	1.10

The actual costs for these operations range from \$0.65 to \$2.12 per tree.

14. **Tree Sales:** Trees are sold wholesale at the roadside for an average cost of \$10.50 per tree. Actual tree prices range from \$6.00 for 56 foot trees to \$19.00 for 10-foot trees. Of the original 1,037 seedlings planted, 650 survive and produce merchantable Christmas trees.

15. **Additional Costs Not Included:**

- **Post-Harvest Site Preparation:** Following complete cutting, major site preparation is often necessary to return the field to a plantable condition. This includes bulldozing remaining trees and stumps, slash disposal, and establishment of a herbaceous cover crop. The average cost for this activity is \$150/ acre.
- **Advertising:** Advertising costs vary widely from grower to grower. These costs are too difficult to estimate on a peracre basis to be included in this analysis.
- **Fencing:** Fencing also varies greatly from grower to grower. Those farms that have pastureland adjacent to Christmas trees will incur this additional cost.
- **Capital Expenditures:** Expenditures for equipment and buildings, and maintenance costs, are not included in this analysis, since these factors vary so much from grower to grower.
- **Land Costs:** The cost of land and property taxes are not included in this analysis.

The economic analysis was conducted on a before-taxes basis, using real rates which do not include inflation.

## Results of the Analysis

The results of the financial analysis are presented in Table 2. A variety of investment analysis attributes are presented, enabling one to look at several different factors at once, with a variety of discount rates.

### Present Net Worth (PNW)

Present net worth is an investment analysis term that discounts the future income, minus costs, of an investment to the present. For example, at an 8% discount rate, the PNW of this investment is \$1131.96 per acre. If the PNW is a positive number, it indicates that the investment will return money to you at a rate higher than the discount rate you selected.

### Benefit/Cost Ratio (B/C)

The B/C ratio is a comparison of all returns and costs, discounted to the present. A favorable investment is one in which the B/C ratio is greater than 1.00. In this case the B/C ratio (at 8% discount rate) is 1.42, indicating a favorable return.

### Annual Equivalent Value (AEV)

The AEV combines all of the costs and revenues into a single sum that is divided equally among all of the years in the investment period. It is very useful for comparing Christmas tree production to annual crop production. For example, at the 8% discount rate, this investment will return an average of \$181.20 per acre for each of the 10 years in the investment period. It is important to note, however, that in the early years of the investment no return will be realized, but after Year 7, when the first trees are harvested, the cash flow back to you begins.

**Table 2. Investment analysis results from growing one acre of white pine Christmas trees in Virginia.**

Discount Rate(%)	6.00	8.00	10.00	12.00	14.00
Present Net Worth (\$/acre)	1440.74	1131.96	863.13	654.28	470.17
Benefit/Cost Ratio	1.48	1.42	1.35	1.29	1.22
Annual Equivalent Value (\$/acre/year)	211.82	181.20	150.20	122.80	95.05
Internal Rate of Return (%)	21.48	21.48	21.48	21.48	21.48

## **Internal Rate of Return (IRR)**

The IRR is the average compound interest earned by an investment over its life. This analysis indicates that an investment in Christmas trees will return 21.48%. Only you can say whether or not this is an adequate return on investment for you. It is important to point out that the IRR is a real rate of return; that is, it does not reflect inflation that occurs during the investment period. If the IRR was adjusted for inflation, it would increase accordingly.

## **Summary**

Christmas tree growing in Virginia can be a profitable venture. Profitability, however, depends on many different factors. In today's market, producing a quality product is the key to success. In Christmas trees, quality products don't just happen. Much thought and work

must go into a project. Failing to carry out any of the practices during the rotation could cause a loss in marketable trees and hence, revenue.

Risk factors associated with Christmas tree production are numerous and they are present for a long period of time, unlike those for annual crops. Growers must constantly watch for potential problems such as fire, insects, or other pests, and react quickly. In addition, an important market risk exists that cannot be ignored. This financial analysis was based upon the sale of trees at \$10.50 each. In some marketing areas over-supply can drive that price down substantially, thus resulting in lower values for PNW, B/C, AEV, etc.

The Christmas tree industry in Virginia is growing. The wholesale market value is estimated at \$7 million per year. Its existence should be fostered and developed to increase its contribution to local and state economies.