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# Douglas-fir Christmas Tree Economics

*The Costs of Establishing and Producing Douglas-fir Christmas Trees in the Willamette Valley*

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# Douglas-Fir Christmas Tree Economics: The Costs of Establishing and Producing Douglas-Fir Christmas Trees in the Willamette Valley

Tim Cross, Chal Landgren, Brenda Turner, and Bob Lisec[1]

## INTRODUCTION

Oregon's Christmas tree production has expanded continuously over the last 10 years. As shown in Figure 1, harvested acreage has more than doubled since 1983. Some less productive and poorly managed Christmas tree operations have ceased operating over the last 3 to 5 years. Many growers have experienced financial stress recently, primarily due to lower prices. Both marketing and production are important for survival in the Christmas tree business.

The increase in Christmas tree acreage has been accompanied by an increase in the total value of Christmas tree farm sales. Figure 2 shows the number of trees harvested annually and average tree prices since 1983. A general downward price trend in the 1980's is partially due to the large numbers of trees that entered the market. The total value of annual Christmas tree sales for all species grown in Oregon topped $70 million in 1992.

About 60 percent of the Christmas trees grown in Oregon are Douglas-fir. Noble fir makes up 25 percent of production and the remaining 15 percent are other species. A small amount of Oregon's Christmas trees are sold within Oregon. Nearly 90 percent are sold in other states or exported to other countries.

This study estimates the economic costs and returns of a typical Christmas tree operation in the Willamette Valley of Oregon. It includes estimates of planting, development and harvest costs associated with Christmas tree production. Since a hypothetical farm is represented in this study, the budgets should be used as a planning or analysis tool for existing and potential growers. Individual production plans, goals, and resources should be considered when reviewing this study.

The first section of the study outlines the assumptions made in constructing the cost and return estimates for Christmas tree production. These assumptions form a common basis for the enterprise budgets which are presented next, along with a discussion of the budgets. The appendix contains a budget for each year in the production process, outlining both fixed and variable costs. Fixed costs are those costs which occur regardless of production, such as land costs, interest on capital, and machinery depreciation. Variable costs are costs incurred in production. Examples include tree purchase and planting, labor,

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pesticides, and harvest costs. All variable costs are considered to be cash costs in this study. Fixed costs are separated into cash and noncash costs. Machinery and equipment insurance, and land leasing are fixed cash costs.

Noncash fixed costs include depreciation and interest on machinery and equipment, interest on investment, and amortized establishment costs.

The study concludes with a price sensitivity analysis. The sensitivity analysis estimates returns from Christmas tree production for a range of Christmas tree sale prices.

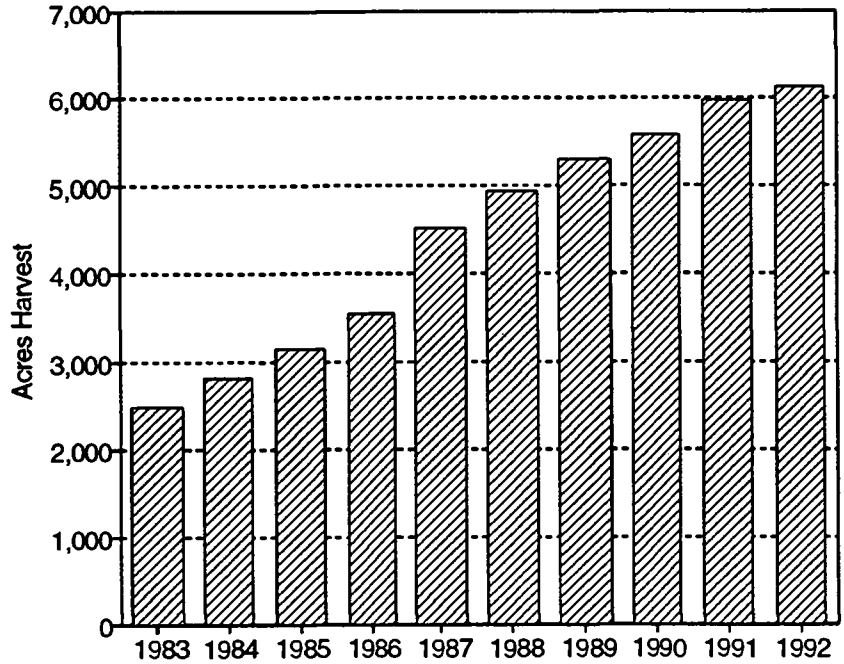


Figure 1. Oregon Christmas Tree Harvested Acres, 1983-1992 (acres represent clearcut area)

Source: Miles, Stanley D. Oregon County and State Agricultural Estimates, Economic Information Office, Oregon State University Extension Service. 1992 and earlier years.

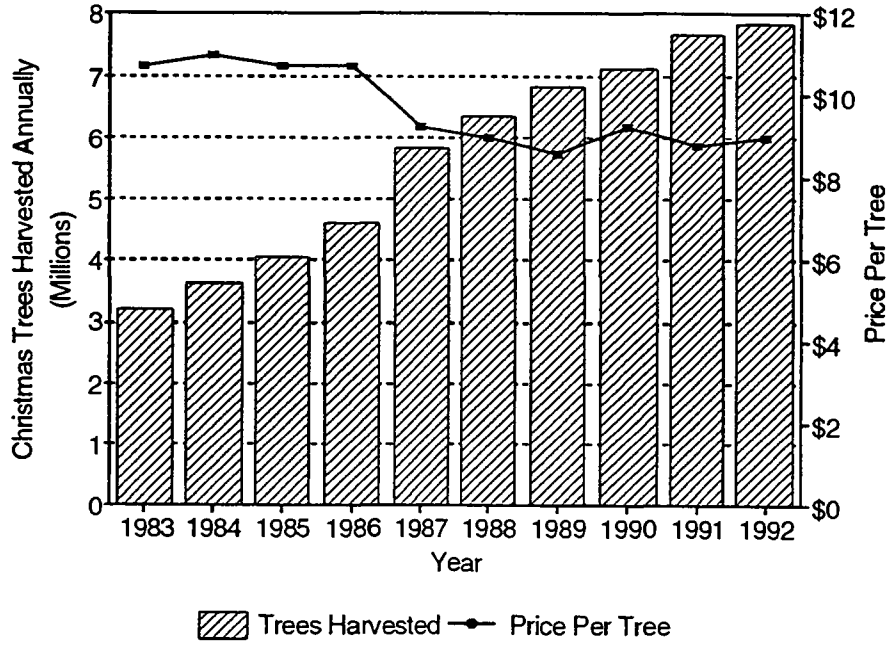


Figure 2. Oregon Christmas Trees Harvested Annually and Average Price Per Tree, 1983-1992

Source: Miles, Stanley D. Oregon County and State Agricultural Estimates, Economic Information Office, Oregon State University Extension Service. 1992 and earlier years.

## ASSUMPTIONS

Several individuals were involved in this study, including growers, researchers and Extension staff. The following broad assumptions were made to provide a common basis for the enterprise budget.

This Christmas tree operation consists of 10 acres on an 80-acre farm. The previous crop was Christmas trees and the land is leased for $80 per acre annually. The lease cost represents either the actual rental cost or if operator owned, the opportunity cost of the land not being leased to someone else.

Owner labor costs $10 per hour. This wage represents the opportunity cost of labor provided by the owner. Hired labor is either charged at a wage of $10 per hour or is paid a piece rate for some operations. The hourly wage represents a cash cost of $7.50 and payroll overhead costs of $2.50 per hour. Payroll expenses include social security taxes, record keeping expenses, and workers compensation insurance. A piece rate is used for planting, shearing, tagging, and cutting the trees. These operations are commonly accomplished using contract labor.

Interest is charged at a 10 percent rate on all capital used to produce Christmas trees. Interest on operating capital is included as a cash expense to represent the cost of borrowing annual operating funds. Long term capital interest is treated as a noncash cost which represents the opportunity cost of capital. The capital invested by the owner/operator to produce Christmas trees could have been invested elsewhere and earned 10 percent interest.

For the purpose of calculating amortized establishment costs, Years 0 through 6 are treated as establishment years and Years 7 and 8 are the production years. Total establishment cost is used to calculate the amortized establishment payments in Years 7 and 8.

Douglas-fir trees were chosen for planting on the 10-acre site and these trees are assumed to take between 6 to 8 years to mature for harvest. A total of 1,500 trees per acre are planted. The trees are quality graded and harvested at the following rates:

| Year(s) | No. 1 Grade Trees Harvested (%) | No. 2 Grade Trees Harvested (%) | Trees Remaining |
|---|---|---|---|
| 1 to 5 | 0 | 0 | 100 |
| 6 | 10 | 0 | 90 |
| 7 | 40 | 0 | 50 |
| 8 | 10 | 30 | 10 |

The study assumes that 10 percent of the planting is not harvested. These trees either died, did not mature prior to harvest, or were not of high enough quality to warrant harvesting. The unharvested trees are cleared at the end of Year 8.

Machinery and equipment purchase prices, useful lives, average annual hours of use and field capacities were obtained from growers. Labor hours for machinery operation are calculated as 1.21 times machinery hours to allow time for adjusting and moving machinery. Specific chemicals are not cited in this study, but the chemical costs in the budgets are representative of pesticides typically used on Douglas-fir Christmas

trees in the Willamette Valley. All prices for capital assets and resources are in 1993 dollar values. Inflation and income taxes are not taken into account in these budgets.

## ENTERPRISE BUDGETS

The purpose of the following enterprise budgets is to estimate the gross revenue, variable costs and fixed costs incurred in each year of production of Douglas-fir Christmas trees in the Willamette Valley of Oregon. Each budget is for one calendar year beginning January 1, and all budgets are calculated as of the end of their respective years. The operations are listed in the approximate order they are performed. All costs and returns are estimated on a dollar per acre basis. The budgets cover a 9-year time period, beginning with land preparation in Year 0 and concluding with clean up in Year 8.

## LAND PREPARATION: YEAR 0

Land preparation takes place during the 12 months preceding the year in which the trees are planted. Ground preparation is custom hired at a total cost of $100 per acre. It includes ripping, discing, and plowing the soil. The previous stumps are removed early in Year 0 also on a custom basis at a cost of $200 per acre. A soil analysis costs $21 and is performed to determine if nutrients are required. No lime is applied to this field. If lime is required, it would cost approximately $100 per acre.

Total variable cost in Year 0 is $339 and total fixed cost is $80. Since the machinery operations in Year 0 are custom hired, the only fixed cost is land lease. Total cost for Year 0 is $419.

## ESTABLISHMENT: YEAR 1

Beginning in Year 1 and continuing through Year 8, the owner scouts the field observing growth and searching for any possible problems. Scouting requires 2 hours of labor per acre during the course of the year.

The trees are planted at a 5.5 by 5.5 foot spacing. One thousand five hundred trees are purchased for 20 cents each and planting is custom hired at 65 cents per tree. Total tree planting cost is $398 per acre.

Weed control includes a tractor/spray boom application with a 12-foot boom, and spot spraying using a backpack sprayer. A 20 horsepower tractor carries the boom and a 50 gallon tank. The tractor spraying operation covers 3 acres per hour. The backpack sprayer costs $100 and is used to spot spray one-third of the acreage with a contact herbicide.

General overhead charges of $75 per acre begin in Year 1 and continue for the life of the Christmas tree operation. The overhead charges include association membership fees, licenses, office supplies, bookkeeping and miscellaneous field supplies such as gloves and saws.

Per-acre variable cost is $549 and pre-acre fixed cost is $124. Fixed costs include land

lease and machinery and equipment insurance and interest and depreciation. Interest on investment is calculated as 10 percent of Year 0 total cost. It represents the opportunity cost of interest foregone due to the investment in Year 0 expenses during Year 1. Alternatively, it may be thought of as the interest cost associated with borrowing money for Year 0 expenses during Year 1. Total per-acre cost in Year 1 is $673. The cumulative per-acre cost for Years 0 and 1 is $1,093.

## PRE-SALE: YEAR 2

The budget for Year 2 is shown in Table 3. Three percent of the trees are assumed to die after planting in Year 1, which requires replanting in the late winter or early spring of Year 2. Owner labor is used for replanting. Weed control is performed with the tractor/spray-boom operation. Herbicide costs $37.50 per acre and 3 acres are sprayed per hour. Sometime between late summer and early winter the trees are pruned. Basal pruning removes the bottom limbs. The per-acre contract labor cost to prune 1,500 trees is $135. Per-acre variable cost in Year 2 is $310. This includes scouting and overhead charges of $20 and $75, respectively. Fixed costs include machinery and equipment costs, land rent and interest on investment for Years 0 and 1. Total per-acre cost is $502 in Year 2. Total cumulative cost per-acre at the end of Year 2 is $1,595.

## PRE-SALE: YEAR 3

Year 3 is similar to Year 2 and is shown in Table 4. The only major addition is a custom shearing operation which costs 9 cents per tree. As the trees grow, shearing costs increase. Since replacement of dead or unhealthy trees in Year 3 would require longer rotation, no replanting is done. Weed control and scouting are the same as previous years. Because the only operation requiring machinery and equipment is weed control, machinery and equipment fixed costs are low, totalling only $2.29 per acre. Remaining fixed costs associated with machinery ownership are assumed to be paid by crops on the other 70 acres of the farm. The total of all per-acre costs in Year 3 is $549. Total cumulative per-acre cost for Years 0 through 3 is $2,144.

## PRE-SALE: YEAR 4

The budget for Year 4 is shown in Table 5. The operations include weed control with the tractor and spray boom, spot spraying with the backpack sprayer, scouting, shearing and an aerial fungicide spray. Shearing cost is increased to 15 cents per tree because the trees are bigger and require more time per tree. In late spring or early summer of Year 4 (about 2 to 3 years prior to initial harvest), a fungicide is applied by helicopter. This custom application costs $15 for the helicopter and $19.50 for the fungicide per-acre.

Per-acre variable cost in Year 4 is $419. Fixed costs per-acre total $299. Per-acre cumulative cost is $2,861.

## PRE-SALE: YEAR 5

In Year 5, shearing costs increase to 20 cents per tree for a total of $300 per acre. The aerial spray includes a fungicide as well as an insecticide. The chemicals cost $24.50 and $15 for the helicopter. Spot spraying at a rate of .75 hours/acre with the backpack sprayer on all of the acreage costs $26. All other operations are the same as Year 4.

Per-acre variable costs in Year 5 are $486. Per-acre fixed costs total $366, and include $286 interest on investment cost for Years 0 through 4. Per-acre cumulative cost at the end of Year 5 is $3,714.

## SALE: YEAR 6

A fertilizer application in the spring of Year 6 costs $60 per-acre. This includes $12 for labor and $48 for the fertilizer. Weed control is the same as Year 5.

Ten percent of the field is assumed to be harvested in Year 6. The trees to be harvested are tagged and cut. Tagging costs 10 cents per tree and cutting costs 12 cents per tree. After the trees are cut, shagging by a 4-person crew costs $52.50 per acre, or 35 cents per tree. Next, a helicopter slings the trees to the loading area. The helicopter is rented for $435 per hour. Slinging bundles from all 10 acres to the loading area requires 1¼ hours. Total helicopter rent is $544, or $54 per acre. Slinging costs 36 cents per tree. At the loading area, the trees are baled. Labor for baling averages 36 cents per tree. Baling requires a baler, purchased for $6,000 with a 10-year life. Baler repairs are estimated to be $100 per year. The twine cost is 35 cents per tree.

A 6-person loading crew uses an elevator to load the trees. The elevator costs $4,000 and has a 10-year useful life. Repairs for the elevator are $50 per year. Loading costs $43.50 per acre for labor, or 29 cents per tree. The trees are loaded onto a truck owned by the buyer, and remaining transportation and marketing costs are the buyers' responsibility.

The total cost to harvest 150 trees is $243, or about $1.62 per tree. Labor cost for harvest is $1.12 per tree. Only grade number 1 trees are sold this year at $8 each. This is slightly below the average tree price from 1983-1992 shown in Figure 2. Gross income is $1,200 ($8 x 150). Total variable cost is $885 and gross income minus variable cost is $315.

Fixed cost includes machinery and equipment costs, land rent, and interest on investment. Insurance, interest and depreciation on machinery and equipment increase significantly in Year 6 due to the additional machinery required for harvest. Total fixed costs is $622. The net projected return is a loss of $307. Total cumulative cost is $4,020.

## SALE: YEAR 7

The budget for Year 7 is shown in Table 8. Weed control, aerial spray, and scouting costs are the same as Year 6. The cost of shearing remains at 25 cents per tree but only 1350 trees are left on the field.

Prior to harvest, the trees to be harvested are tagged. This year, 40 percent of the trees planted are harvested and all are No. 1's. The price remains at $8 each and total gross income is $4800. The harvest operations are the same as Year 6 except more trees are involved this year. The machinery costs differ slightly due to the increase in use this year but repair costs remain at $100 per year for the baler and $50 per year for the elevator. Total harvest cost is $928, or about $1.55 per tree. This is slightly less than the Year 6 harvest cost per tree because the machinery costs increased less than proportionally from Year 6 to Year 7. Gross income minus variable cost is $3,278.

The majority of the trees are harvested in Years 7 and 8, so the costs of establishing the trees during Years 0 through 6 must be recovered in these 2 sale years. Cumulative cost at the end of Year 6 totalled $4,020. Annual payments of $2,317 will just repay this amount, plus interest, in two years. This amortized payment is included in Year 7 and Year 8 budgets to recover costs incurred from Year 0 to Year 6. Total cost in Year 7 is $4,039, and the return over total cost is $761.

## SALE: YEAR 8

Non-harvest operations for Year 8, shown in Table 9, include spot spraying, scouting, shearing at 28 cents per tree, tagging and cleanup of the field after harvest. Shearing costs 3 cents more per tree this year because of the increased tree size. The harvest costs are the same as Year 7 because the same number of trees are harvested. This is the last year of production and 10 percent of the trees are left in the field. Cleanup requires 8 hours to clear each acre.

The remaining trees are cut and removed from the field and the stumps are left in the ground. Total cleanup cost is $100.

Of the 600 trees harvested, 150 are sold as No. 1's for $8 and 450 are sold as No. 2's for $6.40. Total gross income is $4,080. Total cost is $3,949, leaving a net return of $131 in Year 8.

## RESULTS

Figure 3 illustrates graphically the cumulative economic cost required to raise Douglas-fir Christmas trees to maturity. By the end of Year 6, estimated economic costs of over $4,000 per acre are invested in the Christmas tree crop.

In Years 7 and 8, returns over all costs (including repayment of cumulative costs through Year 6 plus interest) are positive. At the assumed prices and costs used in this study, Christmas tree production provides a positive return to owner/operator management and risk. The price received is a particularly important variable. Table 10

summarizes Christmas tree costs and returns at three different price levels. The price for No. 1 grade trees varies from $6 to $10 per tree, and No. 2 grade trees are budgeted at 80 percent of the No. 1 grade price.

At the $6 price level for No. 1 trees a net loss occurs. Costs are higher because in Year 6 reduced prices result in a larger negative net return. This causes cumulative costs for Years 0 through 6 to increase, thereby increasing the amortized payment necessary in Years 7 and 8 to recover these costs.

If the price of No. 1 trees rises to $10, total returns increase and total costs decrease in years 7 and 8. Higher prices result in more income and less debt. Net returns are positive and much larger.

Interpretation of returns from Christmas tree production must recognize that costs and returns occur over a 9-year period, with all returns received toward the end of that time period. Returns received in the future are not valued the same as returns received today because of the time value of money. The value of money is related to when it is received. A dollar received in the future is worth less than a dollar received today. Opportunity cost, inflation, and risk result in positive interest rates which must be used to discount future returns to today's values.

Two measures of discounted returns are shown in Table 10 for each price level. The net present value for each price estimates the total value of Christmas tree production over the 9-year production period in today's dollars, using a 10 percent discount rate. A positive net present value indicates a positive return; a negative net present value suggests a negative return. For Christmas trees, net present value is estimated to be positive for No. 1 prices of $8 and $10, and negative at the $6 price level. At $6 for No. 1 trees, returns do not cover total economic costs.

A second measure useful for evaluating Christmas tree returns is called an equivalent annual annuity. It represents a constant annual return. When discounted over the 9-year production period, it equals the net present value of Christmas tree production. It is assumed to be received every year of the 9-year period, including all pre-sale and sale years. Returns from annual crops, such as grains or annual seed crops, can be directly compared to equivalent annual annuity values. Thus, the equivalent annual annuity is useful in making alternate selections for future crops.

As shown in Table 10, the equivalent annual annuity of Christmas tree production at the $8 price level is $71 per acre. This means that for the prices and costs assumed in this study, the return from Christmas trees over the 9-year production period is equivalent to an annual return of $71 per acre. At the $6 price, an annual loss equivalent to -$128 per acre is incurred, and at the $10 price level an annual positive return of $270/acre is received.

A projected cash flow analysis is shown in Table 11. This table is based on Tables 1-9 and summarizes all cash expenses and returns in Christmas tree production on a per-acre basis. All returns and variable costs (including labor and operating capital interest) are treated as cash flows. For fixed costs, only the cash portions are included from each budget. Depreciation and interest on machinery and equipment is assumed to be a noncash expense, so it does not appear in the cash flow analysis. The amortized

payments on Years 0 through 6 are also not included as cash expenses, because the cash portion of the cumulative development cost is included as the fixed and variable costs of Years 0 through 6.

The net cash flow is negative for Years 0 through 5, indicating that cash expenses exceed cash returns. In Years 6 through 8 net cash flow is positive. The cumulative cash flow at the end of Year 5 is -$2,892, which is the total amount of cash required per acre to raise the trees to 5 years of age.

Cumulative cash flow changes to a positive balance at the end of Year 7, and the final cumulative cash flow is $3,101 per acre. This is the residual cash return what the producer has earned. This amount is available to replace machinery and equipment, provide a return on investment capital, and compensate the operator for management.

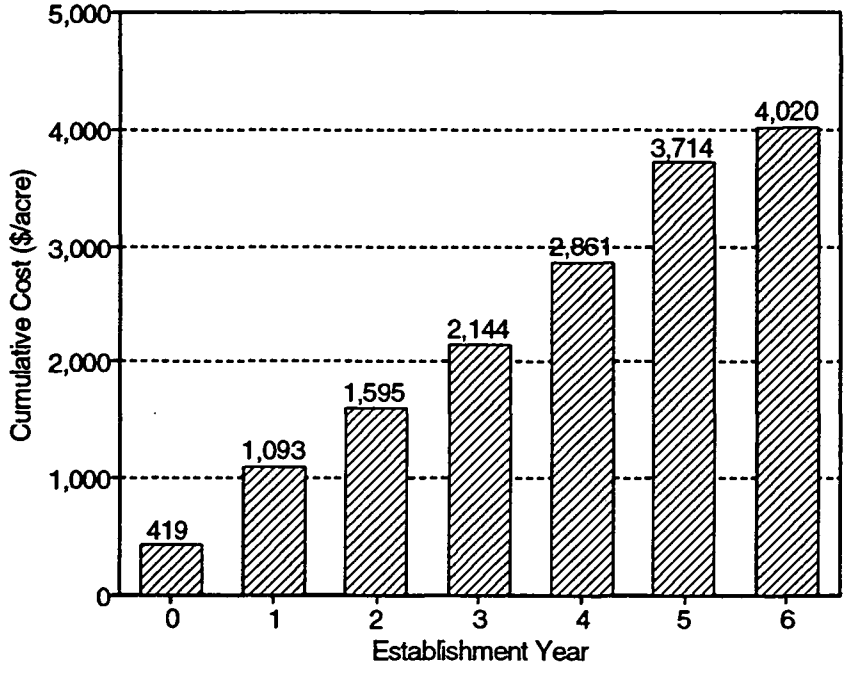


Figure 3. Christmas Tree Cumulative Costs for Years 0 through 6, $/acre

## SUMMARY AND CONCLUSIONS

Christmas trees are an important part of Oregon's agricultural industry, generating over $70 million in sales in 1992. As the number of trees harvested has increased, price has declined, placing pressure on producers to become more cost efficient and operate on narrower profit margins. This study estimates current costs and returns for producing Douglas-fir Christmas trees to provide a framework for others to use in evaluating their individual returns.

Enterprise budgets were developed for each year of the production cycle. Cumulative economic costs for Years 0 through 6 totalled $4,020. The majority of the trees were sold in Years 7 and 8, during which time the investment costs required to produce and harvest the trees were repaid, with interest. Given a price of $8 for No. 1 trees, returns above total costs were positive in both sale years.

A price sensitivity analysis showed that a loss occurred when prices fell to $6 for No. 1 trees. At prices above $8, larger profits occurred. Net present values and equivalent annual annuities were calculated to adjust for the time value of money in producing Christmas trees. Net present value was negative for $6 prices and positive for $8 and $10 prices.

Converted to an annual equivalent basis, Christmas tree production resulted in losses of $128 per acre for 9 years when No. 1 trees sold for $6. At $8 for No. 1 trees the equivalent annual return was $71 per acre, and at $10 the equivalent annual return rose to $270 per acre.

A projected cash flow analysis showed that cumulative cash required to produce Christmas trees peaked at about $2,900 per acre in Year 5. This suggests that anyone considering production of Christmas trees should plan on establishing cash or credit reserves of almost $3,000 per acre to cover their cash flow need until the trees are sold. The cash flow analysis estimated a cash surplus after all sales of $3,100 per acre. This projected surplus is available for machinery and equipment purchases, long term capital interest, and returns to management.

Producers who wish to evaluate their own costs and returns should use this study as a guide. Christmas tree production costs and returns for an individual farm will likely differ from the results estimated here. The budgets should be used as a starting point and modified according to experience and future outlook.

# Appendix A

Table 1. Christmas Tree Land Preparation Year 0, $/acre.

| VARIABLE COST | Description | Labor | Machinery | Materials | Total | Your Cost |
|---|---|---|---|---|---|---|
| Ground Preparation | | 0.00 | 0.00 | $100.00 | $100.00 | _____ |
| Stump Removal | | 0.00 | 0.00 | 200.00 | 200.00 | _____ |
| Soil Test | | 0.00 | 0.00 | 2.10 | 2.10 | _____ |
| Operating Capital Interest | | 0.00 | 0.00 | 37.25 | 37.25 | _____ |
| Total VARIABLE COST | | | | | 339.35 | _____ |
| FIXED COST Description | | | Unit | | Total | |
| CASH Cost | | | | | | |
| Land Lease | | | acre | | 80.00 | _____ |
| Total CASH COST | | | | | 80.00 | _____ |
| Total FIXED Cost | | | | | 80.00 | _____ |
| Total of ALL Cost | | | | | 419.35 | _____ |

Table 2. Christmas Tree Establishment Year 1 Economic Costs, $/acre.

| VARIABLE COST | Description | Labor | Machinery | Materials | Total | Your Cost |
|---|---|---|---|---|---|---|
| Scouting | | $20.00 | $0.00 | $0.00 | $20.00 | ____ |
| Plant Trees | | 0.00 | 0.00 | 397.50 | 397.50 | ____ |
| Trees | 1500 trees x $0.20 = 300.00 | | | | | |
| Plant Trees | 1500 trees x $0.065 = 97.50 | | | | | |
| Spot Spray | | 3.33 | 0.00 | 3.33 | 6.66 | ____ |
| Herbicide | 0.33 acre x $10.00 = 3.33 | | | | | |
| Weed Control | | 4.03 | 1.57 | 11.00 | 16.60 | ____ |
| Herbicide | 1 acre x $11.00 = 11.00 | | | | | |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 54.83 | 33.55 | ____ |
| Total VARIABLE COST | | | | | 549.31 | ____ |
| FIXED COST Description | | | Unit | | Total | |
| CASH Cost | | | | | | |
| Machinery & Equipment Insurance | | | acre | | 0.14 | ____ |
| Land Lease | | | acre | | 80.00 | ____ |
| Total CASH COST | | | | | 80.14 | ____ |
| NONCASH Cost | | | | | | |
| Machinery & Equipment—Depreciation & Interest | | | acre | | 2.22 | ____ |
| Interest on Investment | | | acre | | 41.94 | ____ |
| Total NONCASH Cost | | | | | 44.16 | ____ |
| Total FIXED Cost | | | | | 124.30 | ____ |
| Total of ALL Cost | | | | | 673.61 | ____ |

Table 3. Christmas Tree Pre-Sale Year 2 Economic Costs, $/acre.

| VARIABLE COST | Description | Labor | Machinery | Materials | Total | Your Cost |
|---|---|---|---|---|---|---|
| Scouting | | $20.00 | $0.00 | $0.00 | $20.00 | ____ |
| Replant | | 10.00 | 0.00 | 9.00 | 19.00 | ____ |
| Trees | 45 trees x $0.20 = 9.00 | | | | | |
| Weed Control | | 4.03 | 1.57 | 37.50 | 43.10 | ____ |
| Herbicide | 3 qt x $12.50 = 37.50 | | | | | |
| Basal Pruning | | 0.00 | 0.00 | 135.00 | 135.00 | ____ |
| Basal Pruning | 1500 trees x $0.09 = 135.00 | | | | | |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 18.18 | 18.18 | ____ |
| Total VARIABLE COST | | | | | 310.28 | ____ |
| FIXED COST Description | | | Unit | | Total | |
| CASH Cost | | | | | | |
| Machinery & Equipment Insurance | | | acre | | 0.14 | ____ |
| Land Lease | | | acre | | 80.00 | ____ |
| Total CASH Cost | | | | | 80.14 | ____ |
| NONCASH Cost | | | | | | |
| Interest on Investment | | | acre | | 109.30 | ____ |
| Machinery & Equipment—Depreciation & Interest | | | acre | | 2.14 | ____ |
| Total NONCASH Cost | | | | | 111.44 | ____ |
| Total FIXED Cost | | | | | 191.58 | ____ |
| Total of ALL Cost | | | | | 501.86 | ____ |

Table 4. Christmas Tree Pre-Sale Year 3 Economic Costs, $/acre.

| VARIABLE COST | Description | Labor | Machinery | Materials | Total | Your Cost |
|---|---|---|---|---|---|---|
| Scouting | | $20.00 | $0.00 | $0.00 | $20.00 | ____ |
| Weed Control | | 4.03 | 1.57 | 37.50 | 43.10 | ____ |
| Herbicide | 3 qt x $12.50 = 37.50 | | | | | |
| Shearing | | 0.00 | 0.00 | 150.00 | 150.00 | ____ |
| Shearing | 1500 trees x $0.10 = 150.00 | | | | | |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 18.77 | 18.77 | ____ |
| Total VARIABLE COST | | | | | 306.87 | ____ |

| FIXED COST Description | Unit | Total | |
|---|---|---|---|
| CASH Cost | | | |
| Machinery & Equipment Insurance | acre | 0.14 | ____ |
| Land Lease | acre | 80.00 | ____ |
| Total CASH Cost | | 80.14 | ____ |
| NONCASH Cost | | | |
| Interest on Investment | acre | 159.49 | ____ |
| Machinery & Equipment—Depreciation & Interest | acre | 2.14 | ____ |
| Total NONCASH Cost | | 161.63 | ____ |
| Total FIXED Cost | | 241.77 | ____ |
| Total of ALL Cost | | 548.64 | ____ |

Table 5. Christmas Tree Pre-Sale Year 4 Economic Costs, $/acre.

| VARIABLE COST | Description | Labor | Machinery | Materials | Total | Your Cost |
|---|---|---|---|---|---|---|
| Scouting | | $20.00 | $0.00 | $0.00 | $20.00 | ____ |
| Weed Control | | 8.07 | 2.55 | 25.00 | 35.62 | ____ |
| Herbicide | 2 qt x $12.50 = 25.00 | | | | | |
| Aerial Spray | | 0.00 | 0.00 | 34.50 | 34.50 | ____ |
| Fungicide | 1 acre x $19.50 = 19.50 | | | | | |
| Helicopter | 1 acre x $15.00 = 15.00 | | | | | |
| Spot Spray | | 3.33 | 0.00 | 3.33 | 6.66 | ____ |
| Herbicide | 0.33 acre x $10.00 = 3.33 | | | | | |
| Shearing | | 0.00 | 0.00 | 225.00 | 225.00 | ____ |
| Shearing | 1500 trees x $0.15 = 225.00 | | | | | |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 22.43 | 22.43 | ____ |
| Total VARIABLE COST | | | | | 419.21 | ____ |

| FIXED COST Description | Unit | Total | |
|---|---|---|---|
| CASH Cost | | | |
| Machinery & Equipment Insurance | acre | 0.27 | ____ |
| Land Lease | acre | 80.00 | ____ |
| Total CASH Cost | | 80.27 | ____ |
| NONCASH Cost | | | |
| Interest on Investment | acre | 214.35 | ____ |
| Machinery & Equipment—Depreciation & Interest | acre | 4.07 | ____ |
| Total NONCASH Cost | | 218.42 | ____ |
| Total FIXED Cost | | 298.69 | ____ |
| Total of ALL Cost | | 717.90 | ____ |

Table 6. Christmas Tree Pre-Sale Year 5 Economic Costs, $/acre.

| VARIABLE COST | Description | Labor | Machinery | Materials | Total | Your Cost |
|---|---|---|---|---|---|---|
| Scouting | | $20.00 | $0.00 | $0.00 | $20.00 | ____ |
| Aerial Spray | | 0.00 | 0.00 | 39.50 | 39.50 | ____ |
| Fungicide | 1 acre x $19.50 = 19.50 | | | | | |
| Insecticide | 1 acre x $5.00 = 5.00 | | | | | |
| Helicopter | 1 acre x $15.00 = 15.00 | | | | | |
| Shearing | | 0.00 | 0.00 | 300.00 | 300.00 | ____ |
| Shearing | 1500 trees x $0.20 = 300.00 | | | | | |
| Spot Spray | | 13.33 | 0.00 | 12.50 | 25.83 | ____ |
| Herbicide | 1 acre x $12.50 = 12.50 | | | | | |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 25.52 | 25.52 | ____ |
| Total VARIABLE COST | | | | | 485.85 | ____ |
| FIXED COST Description | | | Unit | | Total | |
| CASH Cost | | | | | | |
| Machinery & Equipment Insurance | | | acre | | 0.01 | ____ |
| Land Lease | | | acre | | 80.00 | ____ |
| Total CASH Cost | | | | | 80.01 | ____ |
| NONCASH Cost | | | | | | |
| Interest on Investment | | | acre | | 286.14 | ____ |
| Machinery & Equipment—Depreciation & Interest | | | acre | | 0.32 | ____ |
| Total NONCASH Cost | | | | | 286.46 | ____ |
| Total FIXED Cost | | | | | 366.47 | ____ |
| Total of ALL Cost | | | | | 852.32 | ____ |

Table 7. Christmas Tree Sale Year 6 Economic Costs and Returns, $/acre.

| GROSS INCOME | Description | Quantity | Unit | $/Unit | Total | Your Cost |
|---|---|---|---|---|---|---|
| Christmas Trees | No. 1's | 150 | tree | $8.00 | $1200.00 | ____ |
| Total GROSS Income | | | | | 1200.00 | ____ |
| **VARIABLE COST** | **Description** | **Labor** | **Machinery** | **Materials** | **Total** | |
| Scouting | | $20.00 | $0.00 | $0.00 | $20.00 | ____ |
| Spot Spray | | 13.33 | 0.00 | 12.50 | 25.83 | ____ |
| Herbicide | 1 acre x $12.50 = 12.50 | | | | | |
| Fertilizer | | 12.00 | 0.00 | 48.00 | 60.00 | ____ |
| Fertilizer | 1 acre x $48.00 = 48.00 | | | | | |
| Aerial Spray | | 0.00 | 0.00 | 34.50 | 34.50 | ____ |
| Fungicide | 1 acre x $19.50 = 19.50 | | | | | |
| Helicopter | 1 acre x $15.00 = 15.00 | | | | | |
| Shearing | | 0.00 | 0.00 | 375.00 | 375.00 | ____ |
| Shearing | 1500 trees x $0.25 = 375.00 | | | | | |
| Tagging | | 0.00 | 0.00 | 15.00 | 15.00 | ____ |
| Tagging | 150 trees x $0.10 = 15.00 | | | | | |
| HARVEST | | | | | | |
| Cut Trees | | 18.00 | 0.00 | 0.00 | 18.00 | ____ |
| Labor | 150 trees x $0.120 = 18.00 | | | | | |
| Shagging | | 52.50 | 0.00 | 0.00 | 52.50 | ____ |
| Slinging | | 0.00 | 0.00 | 54.00 | 54.00 | ____ |
| Helicopter | 150 trees x $0.36 = 54.00 | | | | | |
| Baling | | 54.00 | 10.55 | 5.25 | 69.80 | ____ |
| Twine | 150 trees x $0.035 = 5.25 | | | | | |
| Loading | | 43.50 | 5.35 | 0.00 | 48.85 | ____ |
| Total HARVEST | | | | | 243.15 | ____ |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 36.23 | 36.23 | ____ |
| Total VARIABLE COST | | | | | 884.71 | ____ |
| GROSS INCOME minus VARIABLE COST | | | | | 315.29 | ____ |
| **FIXED COST Description** | | | **Unit** | | **Total** | |
| CASH Cost | | | | | | |
| Machinery & Equipment Insurance | | | acre | | 6.07 | ____ |
| Land Lease | | | acre | | 80.00 | ____ |
| Total CASH Cost | | | | | 86.07 | ____ |
| NONCASH Cost | | | | | | |
| Interest on Investment | | | acre | | 371.37 | ____ |
| Machinery & Equipment—Depreciation & Interest | | | acre | | 164.57 | ____ |
| Total NONCASH Cost | | | | | 535.95 | ____ |
| Total FIXED Cost | | | | | 622.02 | ____ |
| Total of ALL Cost | | | | | 1506.73 | ____ |
| NET PROJECTED RETURNS | | | | | (306.73) | ____ |

Table 8. Christmas Tree Sale Year 7 Economic Costs and Returns, $/acre.

| GROSS INCOME | Description | Quantity | Unit | $/Unit | Total | Your Cost |
|---|---|---|---|---|---|---|
| Christmas Trees | No. 1's | 600 | tree | $8.00 | $4800.00 | ____ |
| Total GROSS Income | | | | | 4800.00 | ____ |
| **VARIABLE COST** | **Description** | **Labor** | **Machinery** | **Materials** | **Total** | |
| Scouting | | $20.00 | $0.00 | $0.00 | $20.00 | ____ |
| Spot Spray | | 13.33 | 0.00 | 12.50 | 25.83 | ____ |
| Herbicide | 1 acre x $12.50 = 12.50 | | | | | |
| Aerial Spray, custom | | 0.00 | 0.00 | 34.50 | 34.50 | ____ |
| Herbicide | 1 acre x $19.50 = 19.50 | | | | | |
| Helicopter | 1 acre x $15.00 = 15.00 | | | | | |
| Shearing | | 0.00 | 0.00 | 337.50 | 337.50 | ____ |
| Shearing | 1350 trees x $0.25 = 337.50 | | | | | |
| Tagging | | 0.00 | 0.00 | 60.00 | 60.00 | ____ |
| Tagging | 600 trees x $0.10 = 60.00 | | | | | |
| HARVEST | | | | | | |
| Cut Trees | | 72.00 | 0.00 | 0.00 | 72.00 | ____ |
| Cut Trees | 600 trees x $0.12 = 72.00 | | | | | |
| Bundling | | 210.00 | 0.00 | 0.00 | 210.00 | ____ |
| Slinging | | 0.00 | 0.00 | 216.00 | 216.00 | ____ |
| Helicopter | 600 trees x $0.36 = 216.00 | | | | | |
| Baling | | 216.00 | 12.22 | 21.00 | 249.22 | ____ |
| Twine | 600 trees x $0.035 = 21.00 | | | | | |
| Loading | | 174.00 | 6.38 | 0.00 | 180.38 | ____ |
| Total HARVEST | | | | | 927.60 | ____ |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 41.30 | 41.30 | ____ |
| Total VARIABLE COST | | | | | 1521.73 | ____ |
| GROSS INCOME minus VARIABLE COST | | | | | 3278.27 | ____ |
| **FIXED COST Description** | | | **Unit** | | **Total** | |
| CASH Cost | | | | | | |
| Machinery & Equipment Insurance | | | acre | | 1.53 | ____ |
| Land Lease | | | acre | | 80.00 | ____ |
| Total CASH Cost | | | | | 81.53 | ____ |
| NONCASH Cost | | | | | | |
| Amortized Year 0—Year 6 Cost | | | acre | | 2316.56 | ____ |
| Machinery & Equipment—Depreciation & Interest | | | acre | | 119.20 | ____ |
| Total NONCASH Cost | | | | | 2435.76 | ____ |
| Total FIXED Cost | | | | | 2517.29 | ____ |
| Total of ALL Cost | | | | | 4039.02 | ____ |
| NET PROJECTED RETURNS | | | | | 760.98 | ____ |

Table 9. Christmas Tree Sale Year 8 Economic Costs and Returns, $/acre.

| GROSS INCOME | Description | Quantity | Unit | $/Unit | Total | Your Cost |
|---|---|---|---|---|---|---|
| Christmas Trees | No. 1's | 150 | tree | $8.00 | $1200.00 | ____ |
| Christmas Trees | No. 2's | 450 | tree | 6.40 | 2880.00 | ____ |
| Total GROSS Income | | | | | 4080.00 | ____ |
| **VARIABLE COST** | **Description** | **Labor** | **Machinery** | **Materials** | **Total** | |
| Spot Spray | | $13.33 | $0.00 | $12.50 | $25.83 | ____ |
| Herbicide | 1 acres x $12.50 = 12.50 | | | | | |
| Scouting | | 0.00 | 0.00 | 0.00 | 20.00 | ____ |
| Shearing | | 0.00 | 0.00 | 210.00 | 210.00 | ____ |
| Shearing | 750 trees x $0.28 = 210.00 | | | | | |
| Tagging | | 0.00 | 0.00 | 60.00 | 60.00 | ____ |
| Tagging | 600 trees x $0.10 = 60.00 | | | | | |
| HARVEST | | | | | | |
| Cut Trees | | 72.00 | 0.00 | 0.00 | 72.00 | ____ |
| Cut Trees | 600 trees x $0.12 = 72.00 | | | | | |
| Bundling | | 210.00 | 0.00 | 0.00 | 210.00 | ____ |
| Slinging | | 0.00 | 0.00 | 216.00 | 216.00 | ____ |
| Helicopter | 600 trees x $0.36 = 216.00 | | | | | |
| Baling | | 216.00 | 12.22 | 21.00 | 249.22 | ____ |
| Twine | 600 trees x $0.035 = 21.00 | | | | | |
| Loading | | 174.00 | 6.38 | 0.00 | 180.38 | ____ |
| Total HARVEST | | | | | 927.60 | ____ |
| Clean-up | | 80.00 | 0.00 | 0.00 | 80.00 | ____ |
| General Overhead | | 0.00 | 0.00 | 75.00 | 75.00 | ____ |
| Operating Capital Interest | | 0.00 | 0.00 | 34.30 | 33.24 | ____ |
| Total VARIABLE COST | | | | | 1431.67 | ____ |
| GROSS INCOME minus VARIABLE COST | | | | | 2648.31 | ____ |
| **FIXED COST Description** | | | **Unit** | | **Total** | |
| CASH Cost | | | | | | |
| Machinery & Equipment Insurance | | | acre | | 1.53 | ____ |
| Land Lease | | | acre | | 80.00 | ____ |
| Total CASH Cost | | | | | 81.53 | ____ |
| NONCASH Cost | | | | | | |
| Amortized Year 0—Year 6 Cost | | | acre | | 2316.56 | ____ |
| Machinery & Equipment—Depreciation & Interest | | | acre | | 119.20 | ____ |
| Total NONCASH Cost | | | | | 2435.76 | ____ |
| Total FIXED Cost | | | | | 2517.29 | ____ |
| Total of ALL Cost | | | | | 3948.96 | ____ |
| NET PROJECTED RETURNS | | | | | 131.04 | ____ |

Table 10. Price Sensitivity Analysis For Christmas Tree Sale Years 7 and 8.

| Price Level ($/tree) | | | Year | | Net Present Value [1] | Equivalent Annual Annuity[1] |
|---|---|---|---|---|---|---|
| No. 1 Trees | No. 2 Trees | | 7 ($/acre) | 8 ($/acre) | ($/acre) | ($/acre) |
| $6.00 | $4.80 | Total Income | $3,600 | $3,060 | | |
| | | Total Cost | 4,212 | 4,122 | | |
| | | Net Return | (612) | (1,062) | ($736) | ($128) |
| 8.00 | 6.40 | Total Income | 4,800 | 4,080 | | |
| | | Total Cost | 4,039 | 3,949 | | |
| | | Net Return | 761 | 131 | 411 | 71 |
| 10.00 | 8.00 | Total Income | 6,000 | 5,100 | | |
| | | Total Cost | 3,866 | 3,776 | | |
| | | Net Return | 2,134 | 1,324 | 1,557 | 270 |

[1] Calculated using a 10% discount rate.

Table 11. Christmas Tree Establishment Cash Flow Analysis ($/acre).

| | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| RETURNS[1] | | | | | | | $1,200.00 | $4,800.00 | $4,080.00 | $10,080.00 |
| CASH VARIABLE COSTS | | | | | | | | | | |
| Ground Preparation | $300.00 | | | | | | | | | 300.00 |
| Plant Trees | | $397.50 | $19.00 | | $194.21 | | | | 610.71 | |
| Cultural Operations | 39.35 | 151.81 | 156.28 | $156.87 | | $185.85 | 266.56 | 256.63 | 214.07 | 1,427.42 |
| Pruning/Shearing | | | 135.00 | 150.00 | 225.00 | 300.00 | 375.00 | 337.50 | 210.00 | 1,732.50 |
| Harvest | | | | | | | 243.15 | 927.60 | 927.60 | 2.098.35 |
| Clean-up | | | | | | | | | 80.00 | 80.00 |
| TOTAL VARIABLE COSTS | 339.35 | 549.31 | 310.28 | 306.87 | 419.21 | 485.85 | 884.71 | 1,521.73 | 1,431.67 | 6,248.98 |
| CASH FIXED COSTS | | | | | | | | | | |
| Land Lease | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 720.00 |
| Mach/Equip Insurance | | 0.14 | 0.14 | 0.14 | 0.27 | 0.01 | 6.07 | 1.53 | 1.53 | 9.83 |
| TOTAL CASH FIXED COSTS | 80.00 | 80.14 | 80.14 | 80.14 | 80.27 | 80.01 | 86.07 | 81.53 | 81.53 | 729.83 |
| TOTAL CASH COST | 419.35 | 629.45 | 390.42 | 387.01 | 499.48 | 565.86 | 970.78 | 1,603.26 | 1,513.20 | 6,978.81 |
| NET CASH FLOW | (419.35) | (629.45) | (390.42) | (387.01) | (499.98) | (565.86) | 229.22 | 3,196.74 | 2,566.80 | 3,101.19 |
| CUMULATIVE CASH FLOW | (419.35) | (1,048.80) | (1,439.22) | (1,826.23) | (2,325.71) | (2,891.57) | (2,622.35) | 534.39 | 3,101.19 | |

[1] Assumes tree prices of $8.00 and $6:40 for No. 1 and No. 2 trees, respectively.

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