

**OPERAT** 

## FOREST RESEARCH REPORT No. 59

No. 59, September, 1995

# The Effect of Various Cultural Treatments on the Growth and Quality of a Balsam Fir Christmas Tree Plantation

#### Introduction

The goal of Christmas tree growers is to produce quality trees for the least cost in the shortest period of time. Site preparation, fertilization, vegetation control and shearing are some of the cultural practices used by growers to

help achieve this goal. But, how many of these treatments are required to produce quality trees? To help answer this question for old field sites, a trial was established on Mount Thom, Pictou County in 1988.

#### Methods

Plantation Establishment and Treatment Description

The trial was established on an old-field at Mount Thom, Pictou County. This site is located on a Kirkhill soil (Webb, 1990), a

well drained, medium-textured, silt-loam of glacial till origin. The vegetation cover consisted of grass (*Gramineae* sp.) (100%), goldenrod (*Solidago* sp.)(60%) and strawberry (*Potentilla* sp.) (5%). The experimental area was divided into 8 blocks. All blocks were planted May 3, 1988, with



<sup>%&#</sup>x27;s add to over 100% because of vegetation layering.

2+2² bare root balsam fir (Ahies balsamea (L.) Mill.) at 1.8 X 1.8 m spacing. During the first 2 years, trees which died were replaced, however results in this report are based on the measurements of "original" trees planted in 1988. Shearing began when the trees reached 1.5 to 1.8 metres tall (Christmas Tree Council of N.S. et al, 1987): earlier if they started to lose their desired shape. Butt pruning, of approximately 30 cm, to the first good branch whorl was carried out when the trees had attained sufficient foliage³. Three cultural treatment regimes; Fertilizing (F), Herbiciding (H), and Liming (L) in various combinations were assigned to these blocks (Table 1).

#### Lime Treatment

Soil samples were collected and analyzed for pH to determine how much lime was

Table	1.	Individual and combined
		treatments by block number.

Block	Fertilize	Herbicide	Lime	Code <sup>2</sup>
1	/	1	1	FHL
2	1	1		FH
3		1	1	HL
4				н
5 and 6	/			F
7 and 8				С

<sup>1</sup> For details of treatments and fiming, see Appendix I.

required to raise the pH to 6.0. The areas were then rotovated three times, with lime added after the second pass and mixed into the soil with the third rotovation. At this time a cover crop of bluegrass (*Poa pratensis* Linn.) and "Dutch White" clover (*Trifolium repens* Linn.) was established. This treatment was carried out during May 1987.

#### Herbicide Treatment

The herbicide treatment (H) consisted of an annual application from 1987 to 1994. All treatments were applied in bands along the planting rows. The first treatment was applied before planting, using Vision<sup>64</sup>, in the fall of 1987. Subsequently, Vision<sup>68</sup> was applied in 1988 and 1989, Simazine in 1990 and Velpar<sup>68</sup>L<sup>4</sup> from 1991 to 1994. In addition, a treatment of Lontrel<sup>84</sup> was required in 1992. The untreated strips between the trees were mowed as required, sometimes as often as 3 times per year.

#### **Fertilizer Treatment**

Fertilizer (F) was applied in a ring beneath the outermost foliage (drip line) of each tree, beginning 2 years after planting. Initially, it was applied at 2 ounces per tree, but in 1991-92, the fertilizer dose was based on tree height and in 1993-94, on foliar analyses. Due to lower foliar nutrient levels, the unherbicided blocks received higher rates of fertilizer than herbicided blocks (Appendix I).

<sup>2</sup> R = Fertilize, H = Herbicide, L = Lime, C = Control.

<sup>2 2+2</sup> represents a 4 year old seedling which spent 2 years in a nursery seedbed followed by 2 years in a nursery transplant bed.

<sup>&</sup>lt;sup>3</sup> For a review of shearing techniques, the reader is directed to the video "Shearing Balsam Fir", available by advance request, from the Nova Scotia Department of Natural Resources Education and Publication Services, Truro, Nova Scotia.

Vision® is a registered trademark of Monsanto Company, Monsanto Canada Inc. Velpar®L is a registered trademark of E.I. duPont de Nemours & Co., du Pont Canada Inc. Lontrel\* is a registered trademark of The Dow Elanco, Dow Chemical Canada Inc.

#### Data Collection

In 1992, 5 years following plantation establishment, measurements were carried out on unsheared trees in all treated blocks. Two sampling methods were used. First, the "original" unsheared trees were systematically sampled to determine total tree height, leader length and root collar diameter. Secondly, 5 to 10 "original" unsheared codominant trees were selected from each treatment and detailed measurements, relating to tree-foliage

density, were recorded to further identify treatment effects (Figure 1).

In 1994, seven years following establishment, another sample of "original" (sheared and unsheared) codominant trees was taken to estimate "years to harvest" and "potential density at harvest⁵". In addition, photographs of trees of average height and crown volume were taken.

Current costs (1994) of each treatment and expected average revenues were provided by one of NSDNR's Christmas tree specialists.

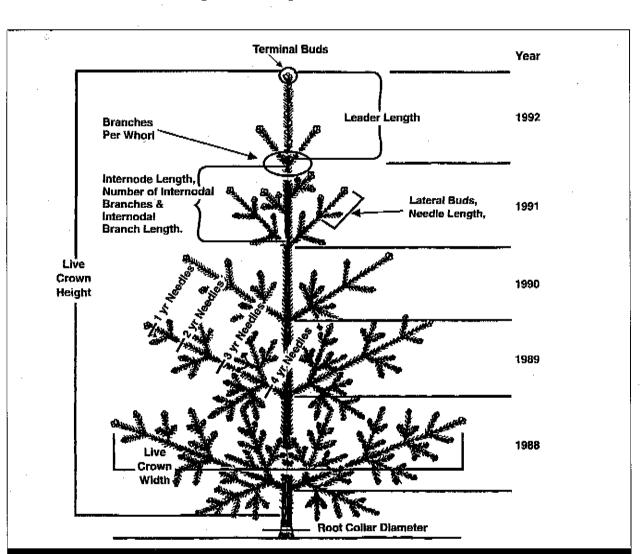


Figure 1. Measurement locations for foliage-density related factors

Foliage density at time of harvest and years to harvest were estimated by a Christmas tree specialist and a research technician.

#### Results

## Five Years after Planting

#### **Growth Comparison**

Five years following planting, the total height, total leader length and root collar diameter of the unsheared trees generally fell into two groups. Trees in herbicided blocks (FHL, FH, HL, H) showed significantly greater growth than those not herbicided (F,C). Treatment with herbicides resulted in average total height, total leader lengths and root collar diameters, at least 40% greater than those in the fertilized block (F) and over 80% greater than in the control block (C)

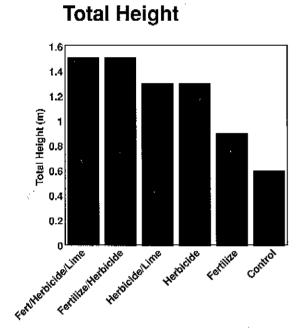
(Table 2, Figure 2). For example, the average total height of trees receiving only herbicide (H) was 1.3 metres compared to 0.6 m for the control. The addition of lime (HL) and fertilizer (FHL and FH) did not significantly increase leader length, total height and root collar diameter (Table 2). Crown volume, on the other hand, was significantly affected by the addition of fertilizer in the herbicided blocks (Figure 2). The average crown volume of the herbicided and fertilized trees (FHL, FH) was roughly double that of trees which received only herbicide (HL, H) and 4 times that of non-herbicided trees (F, C) (0.87 vs 0.45 vs 0.19 m³).

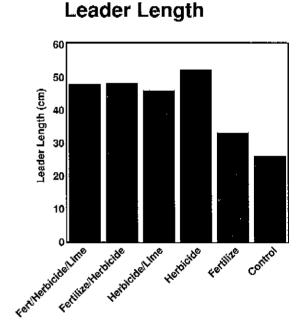
Table 2. Average total height, leader length, root collar diameter and crown volume of balsam fir by treatment, 5 years after planting.

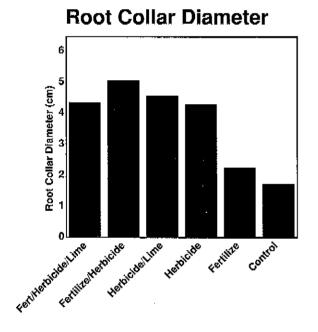
			4 21 22 7 6 6 7 6 6 7 6 6 7 6 7 6 7 6 7 6 7	###±20000000000000000000000000000000000	ar ar ann an Magairt an Aighrean.
		1992 Total	1992 Leader	1992 Root Collar	1992 Crown Volume (m³)
Treatment	Code	Height (m)	Length (cm)	Diameter (cm)	
Fertilize/Herbicide/Lime	FHL	1.5 <sub>A</sub> *	47 <sub>A</sub>	4.3 <sub>B</sub>	0.93 <sub>A</sub>
Fertilize/Herbicide	FH	1.5 <sub>A</sub>	47 <sub>^</sub>	$5.0_{\Lambda}$	0.81 <sub>A</sub>
Herbicide/Lime	HL	1.3 <sub>A,B</sub>	45 <sub>A</sub>	4.5 <sub>A,B</sub>	0.45 <sub>B</sub>
Herbicide	Н —	1.3 <sub>A,B,C</sub>	51 <sub>A</sub>	4.2 <sub>A,B</sub>	0.45 <sub>B</sub>
	F	0.9 <sub>C,D</sub>	32 <sub>B</sub>	$2.2_{ m c}$	$0.23_{ m C}$
Fertilize	<del></del>	- ·	25 <sub>C</sub>	1.7 <sub>C</sub>	$0.15_{\rm C}$
l Control	1 0	0.6 <sub>p</sub>	~~c	~1,70	

Leader length, total height and root collar diameter based upon mechanically sampled free measurements: crown volume based on subset of codominant nees.

based on subscripts A-D: Same letter, within a column, indicates averages are not significantly different at the 5% level based on the Student-Newman-Keuls multiple comparison test (Zar/1974)







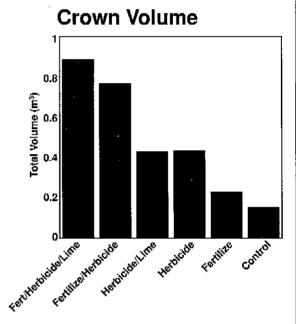


Figure 2. Effect of various combinations of treatments on the total height, leader length, root collar diameter and crown volume of balsam fir Christmas trees, five years following planting and before shearing.

#### **Foliage Density Measures**

The effects of herbiciding, fertilizing and liming on average internode length, internode branch length, branches per internode, and the number of lateral buds and terminal buds generally fell into 3 groups (Table 3). These measures were highest for trees that were both fertilized and herbicided (FHL, FH), intermediate for herbicided trees (HL, H), and lowest for non-herbicided trees (F, C). The lack of response in the fertilizer-only trees is attributed to competing vegetation, especially grass, taking up the fertilizer

instead of the crop trees. Expressed in terms of percent, trees that were both herbicided and fertilized had average internode lengths, branch lengths and number of internode branches 40-170% greater than for herbicided-ed-only trees and 60-600% greater than non-herbicided trees. Adding lime to trees that were herbicided and fertilized, resulted in further gains but only in respect to internode length and number of branches per internode.

No significant differences were found between any of the treatments for number of branches per whorl, needle length and age of oldest needles retained by the tree.

Table 3.	Effect of cultural treatments on various measures of foliage density
Table o.	of codominant balsam fir trees 5 years after planting.
	Of Codoffination Serious.

of cod	omin	ant bak	sam fir i	trees 5	years a	iter biai	ımığ.		
Treatment	Code	1991 Internode Length (cm)	1991 Internode Branch Length (cm)	1991 Branches per Internode (#)	1992 Lateral Buds (#)	1992 Terminal Buds (#)	1991 Branches per Whorf (#)	Needle Length (mm)	Oldest Needles (yr)
Fertilize/Herbicide/Lime	FHL	49 <sub>A</sub> *	46 <sub>A</sub>	35 <sub>A</sub>	5.0 <sub>A.B</sub>	7.6 <sub>A</sub>	3.9 <sub>A</sub>	18.9 <sub>A</sub>	3.0 <sub>A</sub>
Fertilize/Herbicide	FH	41 <sub>B</sub>	48 <sub>A</sub>	23 <sub>B</sub>	5.3 <sub>A</sub>	7.9 <sub>A</sub> .	5.2 <sub>A</sub>	18.7 <sub>A</sub>	3.0 <sub>A</sub>
Herbicide/Lime	HL	23 <sub>c</sub>	31 <sub>B</sub>	13 <sub>C</sub>	4.6 <sub>A,B,C</sub>	7.1 <sub>A,B</sub>	3.9 <sub>A</sub>	19.0 <sub>A</sub>	3.2 <sub>A</sub>
Herbicide	н	26 <sub>C</sub>	33 <sub>B</sub>	13 <sub>C</sub>	4.7 <sub>A,B,C</sub>	7.7 <sub>A</sub>	3.6 <sub>A</sub>	18.8 <sub>A</sub>	3.0 <sub>A</sub>
Fertilize	F	17 <sub>C.D</sub>	28 <sub>B,C</sub>	9 <sub>C</sub>	4.2 <sub>B,C</sub>	6.0 <sub>A,B</sub>	4.0 <sub>A</sub>	18.1 <sub>A</sub>	3.0 <sub>A</sub>
Control	С	10 <sub>D</sub>	210	5 <sub>C</sub>	3.8 <sub>C</sub>	5.1 <sub>B</sub>	3.5 <sub>A</sub>	18.5 <sub>A</sub>	3.2 <sub>A</sub>

<sup>\*</sup>Subscripts A-D:Same letter, within a column, represents a homogeneous group where the populations are not significantly different; at the 5% level, based on the Student-Newman-Keuls multiple comparison test (Zar, 1974).

<sup>1</sup> Number of buds contained in the terminal bud unit, including terminal and subterminal buds.

#### Seven Years after Planting

By 1994, seven years following planting, most trees receiving herbicide treatments had been sheared twice, while most trees in the fertilized only and the control treatments were not yet large enough for shearing.

#### **Foliage Density**

Foliage density, projected to time of harvest, was visually estimated in December of 1994. Sample co-dominant trees were categorized as having either light, medium, or heavy foliage density. Figure 3 illustrates the average foliage density by treatment. Trees receiving herbicide

(H, HL, FH, FHL) were projected to have the highest foliage densities with 78 to 100% graded as medium to heavy (Table 4, Figure 3). The addition of lime and fertilizer did not appear to further improve density. On the other end of the scale, all trees in the fertilized-only (F) and control (C) treatments were projected to have light foliage density.

The effect of the various treatments on average foliage density is illustrated in photographs taken in January of 1995, 7 years after planting (Figure 4). The pictures show the controls and "fertilize only" trees were the shortest and had the lowest foliage density while the herbicided and fertilized trees were the tallest and most dense.

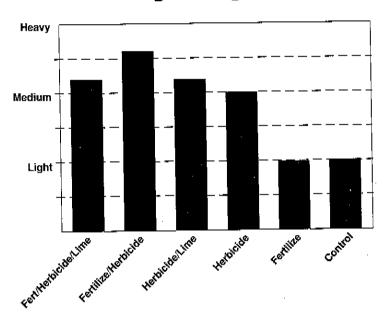
Table 4.	Estimated1	average	foliage density	y and age at	harvest.
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Treatment	% of Trees at Harvest Foliage Density			% of Trees Harvestable (6-8') by Rotation Age  Rotation <sup>2</sup> Age (years)					Average Rotation			
		Light	Medium	Heavy	Medium + Heavy	8	9	10	11	12	13	Age (yrs)
Fertilize/Herbicide/Lime Fertilize/Herbicide Herbicide/Lime Herbicide Fertilize Control	FHL FH ML H F	10 20 22 100 100	60 44 40 44	30 56 40 34	90 100 80 78 0	10	70 56	10 44 30	10 70 78	22 100 88	12	9.2 9.4 10.7 11.2 12.0 12.1

<sup>&</sup>lt;sup>1</sup>Estimates based on examining trees 7 years after planting.

<sup>&</sup>lt;sup>2</sup>Rotation age - estimated number of years (since planting), to reach a harvestable height of 6 - 8 feet.

## **Average Foliage Density**



### Average Harvest Age

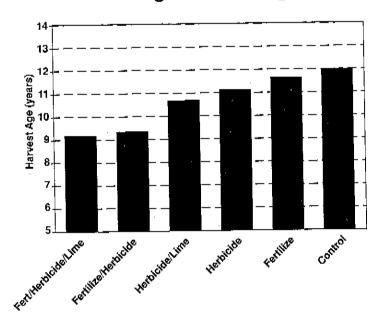


Figure 3. Estimated average foliage density and age at harvest.

Estimates based on trees 7 years after planting.

Harvest age is the estimated number of years (since planting), to reach a harvestable height of 6-8 feet.



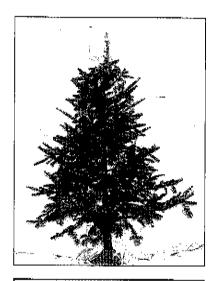
#### Fertilize/Herbicide/Lime (FHL)

Total height (1994) 1.85 m Crown volume (1994) 0.86 m³ Estimated foliage density Heavy Estimated harvest age (years) 9



#### Fertilizer/Herbicide (FH)

Total height (1994) 1.75 m Crown volume (1994) 0.62 m³ Estimated foliage density Heavy Estimated harvest age (years) 10



#### Herbicide/Lime (HL)

Total height (1994) 1.60 m Crown volume (1994) 0.63 m² Estimated foliage density Medium Estimated harvest age (years) 10



#### Herbicide (H)

Total height (1994) 1.40 m Crown volume (1994) 0.51 m³ Estimated foliage density Medium Estimated harvest age (years) 11



#### Fertilize (F)

Total height (1994) 1.58 m Crown volume (1994) 0.57 m³ Estimated foliage density Light Estimated harvest age (years) 10



#### Control (C)

Total height (1994) 1.35 m Crown volume (1994) 0.38 m³ Estimated foliage density Light Estimated harvest age (years) 12

Figure 4. Photographs, taken 7 years after planting, depicting average trees by treatment.

#### Years to Harvest

In addition to foliage density, an estimate was made of the number of years (since planting) to harvest based on a harvest height of 6 - 8 feet (Table 4 and Figure 3). All trees Fertilized and Herbicided (FHL, FH) are projected to be harvestable by 11 years, and over half of the trees by 9 years. All herbicided (HL, H) trees should be harvestable by 12 years with 75% ready for market by age 11. Trees which did not receive herbicide treatments (F,C) are projected to have the longest rotation at 12 to 13 years.

The addition of lime (FHL and HL) appears to slightly reduce the average rotation age and increase the portion of the trees harvestable at younger ages.

#### Costs and Revenues

All treatments carried out for this trial are documented by block number in Appendix I. The current (1994) treatment costs<sup>6</sup> and sale revenues<sup>6</sup> (Appendix II), are also included along with these same values discounted at 5%. Current net revenues, without discounting, ranged from \$1.15 per tree for trees Fertilized (F) to \$4.38 for trees Fertilized and Herbicided (FH).

To compare the before tax economic returns resulting from the treatments over time, the closing balance of a 14 year investment on one acre was examined (Appendix I). It was assumed that each treatment started with a bank account of \$4,000 and monies were taken from this account as treatments were carried out, and added as revenues accrued. The interest was calculated daily and the bank accounts were assumed to earn an annual rate of 5%. Figure 5 shows how each of the Christmas tree bank accounts would change over time. At the end of this time, a non

Christmas tree account would have a value of \$7,923. The only treatment with a lower return was the Fertilizer (F) block which was projected to earn \$7,792. The highest bank balances were achieved by treatments involving herbicide and fertilizer: \$10,579 (FHL) and \$11,636 (FH).

Another way to compare treatments is by looking at their Internal Rate of Return (Gunter et al, 1984) which is the interest rate at which one is indifferent between investing in a project and leaving one's money in the bank. Figure 6 shows the internal rate of return for each treatment, which uses the same parameters as the previous comparison, i.e. an opening bank account of \$4,000 dol-

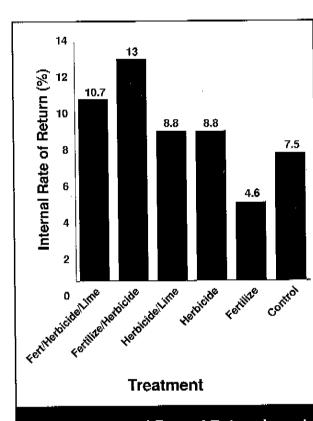


Figure 6. Internal Rate of Return based on a 14-year investment for 6 different treatment regimes.

Costs and revenues were obtained from various industry sources and are based primarily on cultivated natural stands rather than old field plantations. Costs not included were overhead, rental of land, cull trees, monitoring for pests, corrective pruning and soil/foliar analyses.

A comparison of the return on \$4,000 invested in a bank account versus Christmas trees grown according to six different treatment regimes, assuming an interest rate of 5%. Figure 5.

involving Herbicide and Fertilizer have the highest rates of return: 13% for the FH and 10.7% for the FHL. The Herbicide treatments

lars and a 14 year term. The treatments

without fertilizer (HL,H) earned 8.8%, while the fertilizer-only and control earned the lowest internal return amounting to 4.6% (F) and 7.6% (C).

## Conclusions and Summary

The major findings of a trial undertaken to determine the effects of individual and combined treatments of Fertilizer, Herbicide and Lime on the growth, quality and costs of producing balsam fir Christmas trees on an old-

field site are as follows:

Table 5.

Herbicide (HL, H)

Vegetation management using herbicides 1. reduced rotation age and increased height growth, foliage density, and internal rate of return.

Herbicided trees (HL,H) were (Table 5): • 73% taller,

- 79% more frequently projected to have
- medium-heavy density foliage at rotation: had: • 137% greater crown volume,
- 86% more branches per internode,

79

95

90

79

16

-10

11.0

9.3

9.2

-8

-15

-2

8.8

11.8

10.7

2.7

3.0

-2.3

- 8% shorter rotation age, and had a
- 2.7% higher average internal rate of return

than trees not herbicided (F, C).

nai rate or re	tain and t		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		**	
	5-Ye	cars After Plant	w <b>≅</b>	7-Years Aft	er Planting?	Internal
Treatment	Height	Crown Volume	Branches per Internode	Foliage Density <sup>3</sup>	Rotation	Rate of Return
	m % increase	m <sup>3</sup> % increase	# % increase	% % increase	years % increase	Rate % increase
No Herbicide (F, C)	0.75 -	0.19 -	7 -	0 -	12.0 -	6.1 -

137

93

15

13

29

35

123

52

nal rate of return and their % increases by treatment.

Summary of average growth, foliage density, rotation ages and inter-

Herbicide, Fertilizer (HFL, HF)

Herbieide, Fertilizer & Lime (HFL)4

1.3

1.5

1.5

73

15

0

0.45

0.87

0.93

Measurements taken before shearing.

Projections based on 6' - 8' crop height (Table 4). % of trees estimated to have medium to heavy foliage density at rotation (6 - 8' tall):

<sup>%</sup> difference is based on (HFL-HF) x 100.

- The addition of fertilizer further reduced rotation age and increased height growth, foliage density and internal rate of return. Herbicided and Fertilized trees (HFL,HF) were:
  - 15% taller,
  - 16% more frequently estimated to have medium-heavy density at rotation, had
  - 93% greater crown volume,
  - 123% more branches per internode,
  - 15% shorter rotation age, and had a
  - •3% higher average internal rate of preturn

than herbicided trees (HL,H).

- Although less dramatic, the incorporation of lime resulted in decreased rotation age and increased density.
   Herbicided, Fertilized and Limed trees (FHL) were:
  - 15% greater in crown volume, had52% more branches per internode, and a
  - 2% shorter rotation age, than fertilized and herbicided (F, H) trees.
- Based on projections to rotation, the combination of herbicide and fertilizer was the most cost effective treatment in producing balsam fir Christmas trees in a plantation located on an old-field site at Mount Thom, Nova Scotia.

#### Literature Cited

Christmas Tree Council of Nova Scotia, Canadian Forestry Service and Nova Scotia Department of Lands and Forests, 1987. Atlantic Canada Christmas tree growers manual.

Gunter, G.E. and H.L. Haney Jr. 1984. Essentials of Forestry Investment Analysis. OSU Stores Inc., Corvallis, OR, 337 pp. Webb, K.D. 1990. Soils of Colchester County, Nova Scotia Report No. 19. Nova Scotia Soil Survey. Research Branch, Agriculture Canada, Ottawa, Ont. 201 pp.

Zar, J.H. 1974. Biostatistical analysis, Prentice-Hall Inc. Englewood Cliffs, NJ, 620 pp.

# Appendix I. Block 1 - Fertilize/Herbicide/Lime - Description of the cultural treatments and their associated current and discounted costs and revenues, for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

	abandoned neid ir	raic spring	9 01 1300.			
11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		##### <b>C</b> c	) S <b>it</b>	Revenue	6844448914468141814 88844488438648 48844884488	(#16:55;###################################
Date	Activity	Current	Discounted	Current Discounted	Interest	\$4,000 Bank
			(5%)	(5%)	(\$)	Account
			1987	(year 0)	2874168795229791673 	
January 1	Roads	\$200.00	\$200.00	28-23-3-2-3-4-4-4-4-4-4-4-4-4-4-4-4-4-4-4-	untildenniklingeridi	\$3,800.00
Early Spring	Soil samples sent for analysis.	ne				
May 20	Area rotovated with rotovator from tree breeding centre: 2.7 tons/acre lime plus magnesium applied after second pass and worked into soil on third pass.	\$180,00	\$177.00		71	\$3,691.00
May 21	15-5-5 plus magnesium @ 250 lbs/acre applied with cyclone seeder	\$46,00	\$45,00	,	1	\$3,646.00
May 21	Bluegrass and Dutch White Clover broadcast at 3 lbs/acre with cyclone seeder: cultivated area rolled.	\$64,00	\$63,00			\$3,582.00
August 25	Herbicide: Vision <sup>©</sup> @ 3.2 l/ha	\$100.00	\$97.00		46	\$3,528.00
	Total	\$590.00	\$590.00			
		#	1988 (yes	x 1)		
May 3	Planted balsam fir bareroot 2+2	\$570.00	\$534.00		121	\$3,079.00
June 3	Severe frost					
June 18	Herbicide with Vision $^{\oplus}$ , at 1.5% solution (no foliage contact).	\$100.00	\$93.00		19	\$2,998.00
June-Aug	Mowed strips between rows.	\$75.00	\$70.00		11	\$2,934.00
	Total	\$745.00	\$677.27			
			1989 (ye.	u. 2)		
May 10	Fill planted with balsam fir bareroot 2+2.	\$57.00	\$51.00		119	\$2,996.00
June 15	Herbicide: Vision <sup>®</sup> @ Iabel rate (no foliage contact)	\$100.00	\$89.00		15	\$2,911.00
June 15	Fertilizer	\$65.00	\$58.00			\$2,846.00
July 15	Mowed strips between rows.	\$75.00	\$66.00		11	\$2,782.00
	Total	\$297.00	\$245,45		WW.	
germann.	-		1990 (ye	w.3)		
April 23	Herbieide: Simazine @ 7kg/ha	\$100.00	\$85.00		107	\$2,789.00
May 15	Fill planted balsam fir barcroot 2+3.	\$57.00	\$48,00		8	\$2,740.00
May 16	Fertilizer applied - 2.0 oz 17-17-17 (not applied on newly planted trees).	- \$65,00	\$55.00		1	\$2,676.00
June 25	Mowed strips between rows.	\$75.00	\$63.00		25	\$2,626.00

\$223.14

\$297.00

Total

Appendix I. Block 1 - Fertilize/Herbicide/Lime - Description of the cultural treatments and their associated current and discounted costs and revenues, for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

		aalay <u>aa</u> +	Cost	Marketti.	Revenue		
Date	Activity	Current	Discounted (5%)	Current	Discounted (5%)	Interest (\$)	\$4,000 Bank Account
			1991 (yea	r 4)			
May 7	Herbicide: Velpar <sup>@</sup> L @ 5.0 l/ha.	\$100.00	\$81.00			102	\$2,628.00
May 15	Fertilizer applied rate of 2.0 ounces per tree and 1 ounce for every foot of tree over 2 feet, i.e. some trees received 4 ounces of 17-17-17.	\$65.00	\$53.00			3	\$2,566.00
July - early September	Mowed strips between rows.	\$75.00	\$60.00			27	\$2,518,00
November 20 ;	Tipped a few trees that had excessive leader growth, these were not used in the study.	nc					
	Total	\$240.00	\$163.92			7"	
			1992 (yea	r 5)			
May 11	flerbicide: Velpar <sup>®</sup> I. @ 5.0 l/ha,	\$100.00	\$77.00			97	\$2,515.00
May 25	Fertilized - 17-17-17, 2 ounces per tree and 1 ounce per foot of tree height.	\$65.00	\$50.00			5	\$2,455.00
June 17	Treated all trees for aphids: Diazinon - label rates.	\$50.00	\$38.00			8	\$2,413.00
August 24	Herbicide: Lontrel* @ label rates (rotovated areas contained almost 100% Vetch).	nc					
June, July, August	Mowed strips between rows.	\$75.00	\$57.00			14	\$2,352.00
September	Foliage and soil samples were sent for analyses.	nç	•				
October 8	Sheared all trees with long leaders (tipped).	nc					,
	Total	\$290.00	\$180.07				
			1993 (yes	<b>c 6)</b>		fiktiyiti) eyriyi	
May 11	Herbicide: Velpar <sup>®</sup> L @ 8.0 l/ha.	\$100.00	\$73.00			91	\$2,343.00
May 31	Applied fertilizer as prescribed by fall foliar analysis: 2 oz of 0-50-0	\$65.00	\$48.00			6	\$2,284.00
June, July, August	Mowed strips between rows.	\$75.00	\$54.00			19	\$2,228.00
October 20	Foliage and soil sample taken for analysis.	nc					
November 1	All appropriate trees were butt pruned and sheared.	\$450.00	\$322.00			28	\$1,806.00
	Total	\$690.00	\$497.00				

Appendix I. Block 1 - Fertilize/Herbicide/Lime - Description of the cultural treatments and their associated current and discounted costs and revenues, for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

		<i>li Um</i>	est	Ren	enue		What the Edition
	Activity	Current	Discounted	Current	Discounted	Interest	\$4,000 Bank
Date	in Pourly		(5%)	la loù Hall	(5%)	(\$)	Account
			1994 (year	7)		24 1 1 5 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1	
	Herbicide: Velpar®L@	1					
May 11	7.0 l/ha	\$100.00	\$70.00			46	\$1,752.00
func I	Applied fertilizer according to						
	the 1993 foliar analysis results: 0-5-0 (4 ounces) 0-0-61	1				5	\$1,692.00
	(2 ounces)	\$65.00	\$45.00			.3 14	\$1,631.00
fune-Aug_	Mowed strips between rows.	\$75.00	\$52.00		ľ	1.44	\$1,051.00
August 17	Shearing, all blocks (Conventional methods)	\$200.00	\$138.00	!		4	\$1,435.00
	Total	\$440.00	\$305.00				
		The San R	1995 (year 8) E	stimates	, No. (7, 14, 410), Alex A. (2)	ljesti kiterytji i	
May 5	Herbicido	\$100.00	\$67.00			51	\$1,386.00
May 5	Insecticide	\$50.00	\$33.00				\$1,336.00
May 5	Fertilize	\$65.00	\$43.00				\$1,271.00
June-∧ugust	<del>-</del>	\$75.00	\$49.00			15	\$1,211.00
August 15	Shear	\$200.00	\$131.00			2	\$1,013.00
	5 Harvest 10%	\$50.00	\$32.00			12	\$975.00
November 15				\$867.50	\$562.57		\$1,843.00
	Total	\$540.00	\$355.00	\$867.50	\$562.57	· · · · · · · · · · · · · · · · · · ·	
		HARAGARA A	1996 (year 9) l	Estimates ///	(11/19/2014/19/2016)/17/m	<u> Paladiblani</u>	<u> 4-34 </u>
May 5	Herbicide	\$90.00	\$57.00			43	\$1,796.00
May 5	Fertilize	\$58.50	\$37.00				\$1,737.00
Jane-		#KT 50	\$42.00			27	\$1,690.00
August	Mow 3 times	- \$67.50 \$180.00	\$113.00			3	\$1,513.00
August 15	Shear	\$350.00	\$216.00			19	\$1,182.00
November 15		- \$330.00	φ210,00	\$6,072.50	\$3750.00		\$7,255.00
November 15	Sell 70%	- \$746.00	\$465,00	\$6,072,50	\$3750,00		
	Total	is well and the second	1997 (year 10)	Estimates 1974	10111747.03454###################################	2145/75/762024/11	gios de Cogradados da C
Name 6	Herbicide	\$20.00	\$12.00			167	\$7,402.00
May 5	Fertilize	\$13.00	\$8.00				\$7,389.00
June-	TOTALISO	-					#2 462 00
August	Mow 3 times	\$15.00	\$9.00			88	\$7,462.00
August 15	Shear	\$40.00	\$24.00			14	\$7,436.00
November 1		\$50.00	\$29.00		****	92	\$7,478.00 \$8,345.00
November 1	5 Sell 10%	_		\$867.50	\$510.20		\$0,54°C,UV
	Total	\$138.00	\$82.00	\$867.50	\$510.20		The state of the s
100				Estirantes (-)	and was a first or a first for the first	193	\$8,528.00
May 5	Herbicide	\$10.00	\$6.00			, 7.3	\$8,522.00
May 5	Fertilize	\$6.50	\$4.00				\$5,555,00
June-	Mow 3 times	\$7,50	\$4,00			196	\$8,615.00
August August 15	Shear	\$20.00	\$11.00			16	\$8,611.00
	15 Harvest 10%	\$50.00	\$28.00			107	\$8,668.00
	15 Sell 10%			\$867.50	\$485.91		\$9,535.00
1404011001	Total	\$94.00	\$53.00	\$867.50	\$485.91		
			1999 (year 12	) Estimates	s field my felit in kireffun	gwannii	
December	31 Bank Balance					539	\$10,074.00
			2000 (year 13	) Estimates		WHAT WHELL	Marketti (m. 1
December						505	\$10,579.00
	Grand Total	\$5,107.00	\$3,968.00	\$8,675.00	\$5,308.69		

# Appendix I. Block 2 - Fertilize and Herbicide - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

Cost

Revenue

Date	Activity	Current	Discounted (5%)	Corrent	Discounted (5%)	Interest (\$)	\$4,000 Bank Account
			– 1987 (ýca	<b>ir, 0)</b>			
Jan. 1, 1987	Roads	\$200.00	\$200.00				\$3,800.00
August 25	Herbicide: Vision® @ 3.2 Ma.	\$100.00	\$97.00			122	\$3,822.00
	Total	\$300.00	\$297.00				
			1988 (yes	<b>ir 13</b> 0 (1)	(1))		
May 3	Planted balsam fir bareroot 2+2	\$570,00	\$534.00			131	\$3,383.00
June 3	Severe frost						1
June 18	Herbicide: Vision® @ 1.5%.	\$100.00	\$93.00			21	\$3,304.00
July 15	Mowed strips between rows.	\$75,00	\$70.00			12	\$3,241.00
	Total	\$745.00	\$697.00				
	oleanguriar garaga agus an 1944	14,217,17,17,17,17,18,1,1,1,1,1,1,1,1,1,1,1,	1989 (yea	<b>r (2)</b>	13(1) (42) (1) (1) (1) (1) (1)		
May 10	Fill plant balsam fir bareroot 2+2.	\$57.00	\$51.00			132	\$3,316.00
June 15	Vision <sup>®</sup> treatment - shielded spray - 15-20% damage.	\$100.00	\$89.00			16	\$3,232.00
June 15	Fertilizer	\$65.00	\$58.00		}		\$3,167.00
July 15	Mowed strips between rows,	\$75.00	\$66.00			12	\$3,104.00
	Total	\$297.00	\$264.00				
		11/12/04/19/05/25/19/19	1990 (yea	<b>#33</b> ();#():10(;:10());	41744444444444444	\$7641(\$)(#\$7031 <u>3</u> ).	
April 23	Herbieide: Simazine @ 7 kg/ha.	\$100.00	\$85.00			120	\$3,124.00
May 15	Fill planted 500 Balsam fir barcroot 2+3.	\$57.00	\$48.00			9	\$3,076.00
May 16	Fertilizer applied - 2.0 oz 17-17-17 (not applied on newly planted trees).	\$65.00	\$55.00	·			\$3,011.00
July 25	Mowed strips between rows.	\$75.00	\$63.00			29	\$2,965.00
	Total	\$297.00	\$251.00				
1.000	Maring (King belinder Miller)	(4.1514/17.04)	1991 (yea	r.4)	1444912:32331443911439	K:1477413(1)	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )
May 7	Herbicide: Velpar®L @ 5.0 l/ha.	\$100.00	\$81.00			115	\$2,980.00
<b>M</b> ay 15	Fertilizer applied rate of 2.0 ounces per tree and 1 ounce for every foot of tree over 2 feet. i.e. some trees received 4 ounces of 17-17-17.	\$65.00	\$53.00			3	\$2,918.00
July - early September	Mowed strips between rows,	\$75.00	\$60.00			31	\$2,874.00
November 20	Corrective shearing; tipped a few trees that had excessive leader growth, these were not used in the study.	nç					
	Total	\$240.00	\$194.00				
		****					

Appendix I. Block 2 - Fertilize and Herbicide - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

0:28 11247 - 121	vasan andravan vara sama engala kan labahan da		ost	Reveni			
		73	THE STREET STREET, STR	Current	YERVERSON SANCITURES.	Interest	\$4.000 Bank
Date	Activity	Current	Discounted (5%)	Curch	(5%)	(\$)	Account
			\$1,4040137.4474014 (***, 4647)		(1)(()()()()()()()()()()()()()()()()()(	Prinski krimatije Zaprenjem servije	1984 1919 99 1919 1919 1919 1919 1919 14 14 15 16 16 17 18 18 18 18 18 18 18 18 18 18 18 18 18
William Continue			1992 (year	<b>5)</b>	36416941142244))41112216	1544551773440184	\$2,885.00
	Herbicide: Velpar <sup>®</sup> L @ 5.0 l/ha.	\$100.00	\$ <del>7</del> 7.00			11,1	52,003.00
Мау 25	Fertilized - 17-17-17, 2 ounces per tree and 1 ounce per foot					_	22.205.00
	of tree height.	\$65.00	\$50.00			5	\$2,825.00
June 17	freated all trees for aphids: Diazinon - label rates.	\$50.00	\$38.00			9	\$278400
August 24	Lontrel* band for vetch control (nonrotovated areas contained					'	
.•	10% Vetch).	ne					
June, July, August	Mowed strips between rows.	\$75.00	\$57.00			17	\$2,726.00
September	Foliage and soil samples were sent for analyses.	nc					
October 8	Sheared all trees with long leaders (tipped).	nc					
<del>-</del>	Total	\$290.00	\$222.00				
(***Clifes)::rfffes		(MARION ALIGNESIA	1993 (yea	( <b>5</b> )	######################################		
May 11	Herbicide: Velpar <sup>©</sup> L @ 8.0 l/ha.	\$100.00	\$73.00			105	\$2,731.00
May 3I	Applied fertilizers as prescribed						
,	by fall foliar analysis: 4 oz of 0-50-0 and 2 oz of 0-0-61	\$65.00	\$48.00			7	. \$2,673.00
June, July,						23	\$2,621.00
August	Mowed with rotary mower.	\$75.00	\$54.00			23	32,027.00
October 20	Foliage and soil sample taken for analysis.	nc					
November 1	All appropriate trees were but pruned and sheared.	\$450.00	\$322.00			32	\$2,203.00
	Total	\$690.00	\$497.00			<u></u>	
Vir - 1121 - 5223 V	5-01910000000000000000000000000000000000	ANTENE SANGAR	1994 (yes	ú <b>r 7)</b> , j. (57.55) (57.75)	(1788)		
May 11	Herbicide: Velpar © L @ 7.0 l/ha.	\$100.00	\$70,00			57	\$2,160.00
June I	Applied fertilizer according to the 1993 foliar analysis results: 0-0-61 (2 ounces)	\$65.00	\$45,00			6	\$2,101.00
Inland mane		\$75.00	\$52.00			17	\$2,043.00
July/Augus August 17	Shearing, all blocks	1					\$1,848.00
PAREMAL 17	(Conventional methods)	\$200.00	\$138.00			5	\$1,848.UU
	Dotal	\$440.00	\$305.00			reideentsaeena	Premisi (2011) del como de la
				Estimates (   ( ) )		<u>EMFARMITÄTÄR</u>	\$1,813.00
May 5	Herbicide	\$100.00	\$67.00			65	\$1,763.00
May 5	Insecticide	\$50.00	\$33.00				\$1,698.00
May 5	Fertilize	\$65.00	\$43.00			20	\$1,643.00
August 1	Mow 3 times	\$75.00	\$49.00			20	\$1,446.00
August 15	Shear	\$200.00	\$131.00			, ,	0 X 1 - 10 × 10
	Total	\$490.00	\$323.00	nga Tagagaga Masalan	Viiduu ja valtaan kan valtaan ja 1900	igagagagagagagagaga	
agirijalik		4/124/16 HFB.4/HB		Estimates : 12/12/	kaang <u>aat 649.481.642841</u> 41	52	\$1,398.00
May 5	Herbicide	\$100.00	\$63.00			1 2	\$1,333.00
May 5	Fertilize	\$65.00	\$41.00			16	\$1,274.00
August 1	Mow 3 times	\$75.00	\$47.00			3	\$1,077.00
August 15		\$200.00	\$125.00			13	\$870.00
Novemb <u>er</u>		\$220.00	\$136.00	ga 114 00	\$2,540.55	1.7	\$4,984.00
November		meen an	\$415.00	\$4,114.00 \$4,114.00	\$2,540.55		- 14 = 11=
	Total	\$660.00	\$412.00	.,,4,114.00	Ψ2,2 TO 100		

#### Appendix I. Block 2 - Fertilize and Herbicide - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988. nanca and annonement and the section of contract the section of Revenue Material Contract the section of the se

Mar. 6	Y-1	1				42,000,00
May 5	Herbicide	\$56.00	\$22.00		135	\$5,063,00
2.000.000.000.000.000.000.000.000.000.0	40-15/20020-0-16/2019-0-19/2019-0-19/2019-0-19/2019-0-19/2019-0-19/2019-0-19/2019-0-19/2019-0-19/2019-0-19/201 	.77(\$193).49(494.45) 1	1997 (year 10) E	stimates		
5 5 6 1 1 1 2 2 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1	- 1 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2	11/2/2014 (1/4) 12/14 13 11/2/2014 (1/4) 12/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14 13/14	(4) 203	(5%)	(2)	Account
Date	Activity	Current	Discounted (5%)	Current Discounted	Interest	\$4,000 Bank
	HM40144120044.3200033013013140131	782377777248777		4441	4334) ((4334) (454)	
100000000000000000000000000000000000000		Tarring C	ost	Revenue	100001000000000000000000000000000000000	NARESCHENNING NATURE GARACTER

Date	Activity	Cuncit	Discounted (5%)	Current Discounted (5%)	Interest (\$)	\$4,000 Bank Account
1143574201000		<u> 147 (\$1930,93495,951);</u>	1997 (year 10) i	stimates		
May 5	Herbicide	\$56.00	\$22.00		135	\$5,063,00
May 5	Fertilize	\$36.00	\$22.00			\$5,027.00
August 1	Mow 3 times	\$42.00	\$25.00		50	33,027.00

		Caurent	Discounted (5%)	Current Discounted (5%)	Interest	\$4,000 Bank
1011		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1997 (year 10) E			Account
May 5	Herbieide	\$56.00	\$22.00	- www.dam.dam.dam.dam.dam.dam.dam.dam.dam.dam	135	\$5,063.00
May 5	Fertilize	\$36.00	\$22.00			\$5,027.00
August 1	Mow 3 times	\$42.00	\$25.00		59	\$5,044,00
August 15	Shear	\$112,00	\$67.00		10	\$4,942.00
November 15	Harrist 56%	1 #200 00	2445.00		• 37	φ-1,2-12.1.(1

11/04/(1/(01/01			(5%)	5%)	(\$)	Account
<u> </u>			1997 (year 10):1	Sstimates		
May 5	Herbicide	\$56.00	\$22.00		135	\$5,063,00
May 5	Fertilize	\$36.00	\$22.00			\$5.027.00
August 1	Mow 3 times	\$42.00	\$25.00		59	\$5,044.00
August 15	Shear	\$112,00	\$67.00		10	\$4,942.00
November 15	Harvest 56%	\$280.00	\$147.00		91	\$4,753.00
		I	-			1 0-4105.00

	Total Control of the	and the second second second	1227 (9020 109:1	- Services	* A   1   E   O   C   C   C   C   C   C   C   C   C	"我们有我们,但只要要有"我们的是有的有关"。	ママングラス (音楽) カロセー・・・プラリー アジェイト
lay 5	Herbicide	\$56.00	\$22.00		- water Anna III	135	\$5,063.00
lay 5	Fertilize	\$36.00	\$22.00			100	\$5,027.00
ugust 1	Mow 3 times	\$42.00	\$25.00		1	59	\$5,044,00
ugust 15	Shear	\$112,00	\$67,00			10	
ovember 15	Harvest 56%	\$280.00	\$147.00			1	\$4,942.00
ovember 15	Sell 56%	<b>*</b>	Ψ177.00	\$5,236,00	this community	91	\$4,753.00
	Total	\$526.00	6000 AA	#5,430,00 #5,004,00	\$3,079,46		\$9,989.00

Aay 5	Fertilize	\$36.00	\$22.00				Ø5 007 00
lugust 1	Mow 3 times	\$42.00					\$5,027.00
7.1			\$25.00			59	\$5,044.00
kugust 15	Shear	\$112,00	\$67.00			10	\$4,942.00
lovember 15	Harvest 56%	\$280.00	\$147.00			91	\$4,753.00
lovember 15	Sell 56%			\$5,236.00	\$3,079,46	71	
"-"				,	\$3,079.46		\$9,989.00
	Total	\$526.00	\$283.00	\$5,236,00	93 070 46		

1988 (year 11) Estimates

1999 (year 12) Estimates

2000 (year 13) Estimates

\$9,350.00

\$3,745.00

\$4,925,00

564

528

555

\$5,620.01

\$10,553.00

\$11,081.00

\$11,636.00

December 31 Bank Balance

December 31 Bank Balance

Bank Balance

Grand Total

December 31

August I	Mow 3 times	\$42.00	\$25.00		0	59	\$5,044,00
August 15	Shear	\$112,00	\$67,00			10	\$4,942.00
November 15	Harvest 56%	\$280.00	\$147.00			91	\$4,753.00
November 15	Sell 56%			\$5,236,00	\$3,079,46	71	\$9,989,00
"	Total	\$526,00	\$283.00	\$5,236.00	\$3,079.46		\$9,505,00

Appendix I. Block 3 - Herbicide and Lime - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

Cost and the cultural treatments and their associated current and discounted for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

		199, 1274) 1.1.1913 199, 1974) 1.1.1913	: <b>9_OSC</b> )(:12)(/44)((44)((44)(44)	A Property of the second of th		
Date	Activity	Current	Discounted (5%)	Current Discounted (5%)	Interest (\$)	\$4,000 Bank Account
			- 1 to 1, 2 to 1 4 to 1 to 2		14445 <b>327</b> 0144	XXXX
			1988 (year 1)			
January	Roads	\$200.00	\$200.00			\$3,800.00
harly Spring	Soil samples sent for analysis.	nc				
May 20	Area rotovated with rotovator from tree breeding centre: 2.7 tons/acre lime plus magnesium applied after second pass and worked into soil on third pass.	\$180.00	\$1.77.00		71	\$3,691.00
May 21	15-5-5 plus magnesium @ 250 lbs/acre applied with cyclone seeder	\$46.00	\$45.00		ī	\$3,646.00
May 21	Bluegrass and Dutch White Clover broadcast at 3 lbs/acre with cyclone seeder; cultivated area rolled.	\$64.00	\$63.00			\$3,582.00
August 25	Herbicide: Vision® @ 3.2 l/ha.	\$100.00	\$97.00		46	\$3,528.00
	Total	\$590.00	\$582.00			
	NA ENERGY CANADA	urielatu.	1988 (year 1)	rtekanopagtattaväktiiktäsyttii.	STANIA OF	
May 3	Planted balsam fir bareroot 2+2	\$570.00	\$534.00		121	\$3,079.00
June 3	Severe frost					
June 18	tterbicide: Vision® @ 1.5%.	\$100.00	\$93.00		19	\$2,998.00
June-Aug	Mowed strips between rows	\$75.00	\$70.00		11	\$2,934.00
	Total	\$745.00	\$697.00			
			1989 (year 2)		111111111111111111111111111111111111111	onder Herber
May 10	Fill planted approximately 100 balsam fir barcroot 2+2.	\$57.00	\$51.00		119	\$2,996.00
June 15	Herbicide: Vision® treatment @ label rate.	\$100.00	\$89.00	-	15	\$2,911.00
July 15	Mowed strips between rows.	\$75.00	\$66.00		11	\$2,847.00
	Total	\$232.00	\$191.74			
4-1/1/1/19		1783	1990 (year 3)		4(74472)(-1951);	
April 23	Herbicide: Simazine @ 7 kg/ha.	\$100.00	\$85.00		110	\$2,857.00
May 15	Fill planted 500 Balsam fir bareroot 2+3.	\$57.00	\$48.00		8	\$2,808.00
July 25	Mowed strips between rows.	\$75.00	\$63.00		27	\$2,760.00
	Total	\$232.00	\$196.00		<u></u>	
	Garage and State of the Control of t	1 /////////	1991 (year 4)		W(M)	######################################
May 7	Herbicide: Volpar <sup>®</sup> L @ 5.0 l/ha.	\$100,00	\$81.00		108	\$2,768.00
July - early September	Mowed strips between rows.	\$75,00	\$60.00		32	\$2,725.00
November 20	Corrective shearing; tipped a few trees that had excessive leader growth, these were not used in the study.					
	Total	nc \$175.00	\$141.00			
Asian je ne sastas	riota. Situatoria di Panta (Santifana de Cita)	31/3.00			Valentario (* (* (* (* (* (* (* (* (* (* (* (* (*	I 1938:5039:78131.4007-7917:51.0
May 11	Herbicide: Velpar <sup>©</sup> L @ 5.0 l/ha.	\$100.00	\$77.00	**************************************	105	\$2,730.00
June 17	Treated all trees for aphids:	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	277.00			
	Diazinon - label rates.	\$50.00	\$38.00		14	\$2,694.00
August 24	Herbicide: Lontrel* @ label rate (rotovated areas contained almost 100% Vetch).	nc				
June, July, August	Mowed strips between rows.	\$75.00	\$57.00		16	\$2,635.00
October 8	Sheared all trees with long leaders (tipped).	nc				
-	Total	\$225.00	\$172.00			
	· · · · · · · · · · · · · · · · · · ·	37,860,000	19 / F 21.171/	1	<u> </u>	

# Appendix I. Block 3 - Herbicide and Lime - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

			Cost	<b>J</b>	levenue		
Date	Activity	Current	Discounted	Current	Discounted	Interest	\$4,000 Bank
421047214439174 ************************************			(5%)		(5%)	(\$)	Account
975965844			1993 (year 6)				
May 11	Herbicide: Velpar®L@ 8.0 l/ha .	\$100.00	\$73.00			101	\$2,636.00
June, July, August	Mowed stips between rows.	\$75.00	\$54.00			29	\$2,590.00
November 1	All appropriate trees were butt pruned and sheared.	m450.00					
	Total	\$450.00	\$322.00			33	\$2,173.00
(412+\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	10tal	\$625.00	\$449.00		11.22 and 11.2 and 12.22 and 12.22	2	
May 11	Herbicide: Velpar <sup>QQ</sup> L@ 7.0 l/ha.	(M.) (SW) 200 00	1994 (year 7)	tarigi 23 (SPERMAN T			18940110653754001-00501500
June, July,	Treatment Verpai - Lay 7.0 t/na.	\$100.00	\$70.00			56	\$2,129,00
August	Mowed strips between rows.	\$75.00	\$52.00			23	\$2,077.00
August 17	Shearing, all blocks (Conventional methods)	\$200.00	\$138.00			5	\$1,882.00
	Total	\$375.00	\$260.00			_	
		19	95 (year 8) Estimates			1 2 2 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Zágyátávátát szárábben valtatára
May 5	Herbicide	\$100.00	\$67.00	A	200 14 hours of \$4.50 14 1 1 1 1 1 1 1 1 1	66	\$1,848.00
May 5	Insecticide	\$50.00	\$33.00				\$1,798.00
August 1	Mow 3 times	\$75.00	\$49.00			22	\$1,745.00
August 15	Shear	\$200.00	\$131.00			3	\$1,548.00
	Total	\$425.00	\$280.00				,
		199	96 (year 9) Estimates			111111111111	
May 5	Herbicide	\$100.00	\$63.00	710		56	\$1,504.00
August 1	Mow 3 times	\$75.00	\$47.00			17	\$1,446.00
August 15	Shear	\$200.00	\$125.00			3	\$1,249.00
	Total	\$375.00	\$235.00				
		199	7 (year 10) Estimates			121 V. 2 C V. 2	Minter eine Eine Eine eine Gera
May 5	Herbicide	\$100.00	\$60.00	***************************************		45	\$1,194.00
August I	Mow 3 times	\$75.00	\$45.00			14	\$1,133.00
August 15	Shear	\$200.00	\$119.00			2	\$935.00
November 15	Harvest 30%	\$150.00	\$88.00			12	\$797.00
November 15	Sell 30%			\$2,580.00	\$1,517.38		\$3,377.00
	Total	\$525,00	\$312.00	\$2,580.00	\$1,517.38		
		1998	(year 11) Estimates		MARING MARING	\$\$7408450.85\$	
May 5	Horbicide	\$70.00	\$40.00	"		78	\$3,385,00
August 1	Mow 3 times	\$52.50	\$30.00			39.5	\$3,372.00
August 15	Shear	\$140.00	\$79.00			7	\$3,239.00
November 15	Harvest 70%	\$350.00	\$196.00			40	\$2,929.00
November 15	Sell 70%			\$6,020.00	\$3,371.96	-	\$8,949.00
	Total	\$612.50	\$345.00	\$6,020.00	\$3,371.96		
Matematik		1999	(year 12) Estimates		P)		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
December 31	Bank Balance			-		505	\$9,454.00
		2000	(year 13) Estimates		\$\$\$1452\$(\$\$\$\$\$\$)\$\$\$\$	\$4,4134 () { £13	
December 31	Bank Balance					474	\$9,928.00
	Grand Total	\$5,136.50	\$3,877.00	\$8,600.00	\$4,889,34		

Appendix I. Block 4 - Herbicide only - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

		Cost		Revenue	\$\$15352.5451 \$\$15352.5451	11227831173641,1271211313 1423114741147
Date	Activity	Current	Discounted (5%)	Current Discounted (5%)	Interest (\$)	\$4,000 Bank Account
		4.10.51 kHPQ	1987 (year 0)	30433904314460224753824443143034331537	701224242424 201224242424	ngereinen med getregen er einer bekommen bespiele er behalt der bekommen. Die gestellt der State der der der der der der der der der de
January 1	Roads	\$200.00	\$200.00			\$3,800.00
August 25	Herbicide: Vision® @ 3.2 1/ha.	\$100.00	\$97.00		122	\$3,822.00
	Total	\$300.00	\$297.00			
			1988 (year 1)		W. 10 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (	
May 3	Planted balsam fir bareroot 2+2	\$570.00	\$534.00		131	\$3,383.00
June 3	Severe frost					1
June 18	Herbicide: Vision® @ 1.5%.	\$100.00	\$93.00		21	\$3,304.00
July 15	Mowed strips between rows.	\$75.00	\$70.00		12	\$3,241.00
	Total	\$745.00	\$697.00			
			1989 (year 2)			
May 10	Fill planted approximately 100 balsam fir bareroot 2+2.	\$57.00	\$51.00		132	\$3,316.00
June 15	Herbicide: Vision® @ label rate.	\$100.00	\$89.00		16	\$3,232.00
July 15	Mowed strips between rows.	\$75.00	\$66.00		13	\$3,170.00
	Total	\$232.00	\$206.00			
			1990 (year 3)			
April 23	Herbicide: Simazine @ 7 kg/ha.	\$100.00	\$85.00		121	\$3,191.00
May 15	Fill planted 500 balsam fir barcroot 2+3.	\$57.00	\$48.00		10	\$3,144.00
July 25	Mowed strips between rows.	\$75.00	\$63.00		30	\$3,099.00
	Total	\$232.00	\$196.00			
		govania-	1991 (year 4)			
May 7	Herbieide: Velpar⊗L @ 5.0 l/ha.	\$100.00	\$81.00		121	\$3,120.00
July - carly September	Mowed strips between rows.	\$75.00	\$60.00		36	\$3,081.00
November 20	Corrective shearing; tipped a few trees that had excessive leader growth, these					
	were not used in the study.	nc \$175.00	\$141.00	'		
95.5 - 2. ( <u>1</u> 04.2866) 104	Total	01.75,000 و بريايي دروايي 1.75,000 و بريايي درواي	5141.00 1992 (year 5)	I Service de la recompansa de la composition della composition del	[   (g)(()()(h))	FELORESPENIES (1771) - FELORES (1771) -
May 11	Herbicide: Velpar®L@ 5.0 l/ha.	\$100.00	1	::::::::::::::::::::::::::::::::::::::	119	\$3,100.00
June 17	Treated all trees for aphids: Diazinon -					
August 24	label rates.  Herbicide: Lontrel* @ label rate. (nonrotovated areas contained 10% Veten)	\$50.00 nc	\$38.00		15	\$3,065.00
June, July, August	Mowed strips between rows.	\$75.00	\$57.00		19	\$3,009.00
October 8	Sheared all trees with long leaders (tipped).	nc				
	Total	\$225.00	\$172.00			
		71317427 1418 31 11374 1138 1138 1138 1138 1138 1138 1138 113	1993 (year 6)	 		ki 1780,70 (KW 1880), Umpi Sili.
May 11	Herbicide: Velpar@L @ 8.0 I/ha.	\$100.00	,		116	\$3,025.00
June, July,						
August	Mowed strips between rows.	\$75.00	\$54,00		33	\$2,983.00
November 1	All appropriate trees were butt proned and sheared.	\$450.00	\$322.00		37	\$2,570.00
	Total	\$625.00	\$449.00			

Appendix I. Block 4 - Herbicide only - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

			Cost	R	evenue		
Date	Activity	Current	Discounted (5%)	Current	Discounted (5%)	Interest (\$)	\$4,000 Bank Account
		() ((((((((((((((((((((((((((((((((((((	1994 (year 7)			den en de la companya	
May 11	Herbicide: Velpar <sup>09</sup> L @ 7.0 l/ha.	\$100.00	\$70.00			66	\$2,536.00
July/August	Mowed strips between rows (2 times).	\$75.00	\$52.00			28	\$2,489.00
August 17	Shearing, all blocks (Conventional methods)	\$200.00	\$138.00			6	\$2,295.00
	Total	\$375.00	\$260.00				
			1995 (year 8) Estimates		}\$	hii ji kiliye	
May 5	Herbieide	\$100.00	\$67.00			81	\$2,276.00
May 5	Insecticide	\$50.00	\$33.00			0	\$2,226.00
August 1	Mow 3 times	\$75.00	\$49.00			26	\$2,177.00
August 15	Shear	\$200.00	\$131.00			5	\$1,982.00
	Total	\$425.00	\$280.00				•
		1971-1945-195 - 1 275-495 - 15,11	1996 (year 9) Estimates	es Car Head	Jacobski (Bartina Millage)	1	
May 5	Herbieide	\$100.00	\$63.00		,	71	\$1,953.00
August i	Mow 3 times	\$75.00	\$47.00			23	\$1,901.00
August 15	Shear	\$200.00	\$125.00			3	\$1,704.00
	Total	\$375.00	\$235.00				
	Le Perveya en en en par outres de compres de participation		1997 (year 10) Estimates		::	:))))))))))	
May 5	Herbicide	\$100.00	\$60.00			61	\$1,665.00
August 1	Mow 3 times	\$75.00	\$45.00			20	\$1,610.00
August 15	Shear	\$200.00	\$119.00			3	\$1,413.00
	Total	\$375.00	\$224.00	,			
	Para Pilak Marabak garabah karan Ayak di Karan P	)[446]2.204	1998 (year 11) Estimates	vier in telephy	Logijandjelikkijajig	dille dillo	Mintil our contraction
May 5	Herbicide	\$100.00	\$57.00			51	\$1,364.00
August 1	Mow 3 times	\$75.00	\$43.00			16	\$1,305.00
August 15	Shear	\$200.00	\$113.00			2	\$1,107.00
November 15	Harvest 78%	\$390.00	\$218.00			14	\$731.00
November 15	Sall 78%			\$6,540.30	\$3,663.39		\$7,271.00
	Total	\$765.00	\$431.00	\$6,540.30	\$3,663.39		
		1. (3)	1999 (year 12) Estimates		in i garanti 1725, 2000 dan Makamatan 2001 dan	100000000000000000000000000000000000000	
May 5	Herbicide	\$22.00	\$12.00			168	\$7,417.00
August 1	Mow 3 times	\$17.00	\$9.00			89	\$7,489.00
August 15	Shear	\$44.00	\$24.00			14	\$7,459.00
November 15	Harvest 22%	\$110.00	\$59.00			92	\$7,441.00
November 15	Sell 22%			\$1,844.70	\$984.06		\$9,286.00
	Total	\$193.00	\$104,00	\$1,844.70	\$984.06		
		gradition (2	2000 (year 13) Estimates		\$100.000 (\$10.000)	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1	
December 31	Bank Balance		TOTAL			525	\$9,811.00
	Grand Total	\$5,041.50	\$3,694.00	\$8,385.00	\$4,647.45		

Appendix I. Blocks 5 & 6 - Fertilize only - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

	aonea nela in the spring	01 1300.				
			Cost	Reverue		
Date	Activity	Current	Discounted (5%)	Current Discounted (5%)	Interest (\$)	\$4,000 Bank Account
			1988 (year 1)		1	7:42:7:27:24:34:4:1:1:2:4:4:7: 7::1:4:4:4:4:4:4:4:4:4:4:4:4:4:4:4:4:4:4
January 1987	Roads	\$200.00	\$200,00			\$3,800.00
May 3, 1988	Planted balsam fir bareroot 2+2	\$570.00	\$534,00		256	\$3,486.00
June 3	Severe frost	nc				
	Total	\$770.00	\$734.00			
	i digitali da karangan da k	efertalishin	1989 (year 2)		1,120f2(f3)); 2,730f3(f3));	Called May Charles
May 10	Fill planted balsam fir barcroot 2+2.	\$57.00	\$51.00		178	\$3,607.00
June 1.5	Fertilizer	\$65.00	\$58.00	· ·	17	\$3,559.00
	Total	\$122.00	\$109.00			
in feriologia		m, Property	1990 (year 3)		473451447);;	(4:000 H
May 15	Fill planted balsam fir bareroot 2+3.	\$57.00	\$48.00		163	\$3,665.00
May 16	Fertilizer applied - 2.0 oz 17-17-17 (not applied on newly planted trees).	\$65.00	\$55.00			\$3,600.00
	Total	\$122.00	\$103.00	,		
		MACRATRA	1991 (year 4)			
May 15	Fertilizer applied rate of 2.0 ounces per tree and I ounce for every foot of tree over 2 feet. i.e. some trees received 4 ounces of 47-17-17.	\$65.00	\$ <b>53.00</b>		180	\$3,715.00
November 20	Corrective shearing; tipped a few trees that had excessive leader growth, these were not used in the study.	ne				
	Total	\$65.00	\$53.00			
		1211/11/11/11/11/11	1992 (year 5)			terang panggan ang panggan
May 25	Fertilized - 17-17-17, 2 ounces per tree and 1 ounce per foot of tree height.	\$65.00	\$50.00		191	\$3,841.00
June 17	Treated all trees for aphids: Diazinon - label rates.	\$50.00	\$38.00		12	\$3,803.00
September	Foliage and soil samples were sent for analyses.	n¢				
October 8	Sheared all trees with long leaders (tipped).	nc				
	Total	\$115.00	\$88.00			
. Nebel 1 (1942) 2	intropiasian menjera anaka kalendua		1993 (year 6)		(14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
May 31	Applied fertilizers as prescribed by fall foliar analysis: Block 3: 3 oz of 20-5-5, Block 4: 2 oz of 0-50-0 and 2 oz of 0-0-61.	\$65.00	\$48.00		181	\$3,919.00
October 20	Foliage and soil sample taken for analysis	пс				
November 1	All appropriate trees were butt pruned and sheared.	\$450.00	\$322.00		82	\$3,551.00
	Total	\$515.00	\$370.00			
2007 ( Jan 700 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (		114-1.50	1994 (year 7)	114719111111111111111111111111111111111		
June I	Applied fertilizer according to the 1993 foliar analysis results: Block 3; 0-0-61 (2 ounces), Block 4; 3 oz of 20-5-5.	\$65.00	) \$45.00		102	\$3,588.00
August 17	Shearing, all blocks (Conventional methods)	\$200.00	\$138.00		37	\$3,425.00
	Total	\$265.00	\$183.00			

Appendix I. Blocks 5 & 6 - Fertilize only - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

		$M_{ij}^{ij}$	ost	Ré	venue		
Date	Activity	Current	Discounted (5%)	Current	Discounted (5%)	Interest (\$)	\$4,000 Bank Account
	67 () 68 g = 10 a b g ( a b c f ( le avg) a Vietge aksirula a basari	1447 (* 177) († 17 <b>9</b> 9	)5 (year 8) Estimates		Biografia di Bioglicia da	(1/1)/////((1/2)	internación de la composition de la co
May 5	Insecticide	\$50.00	\$33.00			121	\$3,496.00
May 5	Fertilize	\$65.00	\$43.00				\$3,431.00
August 15	Shear	\$200.00	\$131.00			48	\$3,279.00
	Total	\$315.00	\$207.00				
	areesta (lage creata aree) (la porte aree) (lage caracia de la composition de la composition de la composition	199	06 (year 9) Estimates		W(\$445)/46\$X797/6887	//////////////////////////////////////	49-49-43-7-43-(1000-31-6-11)
May 5	Fertilize	\$65.00	\$41.00		•	117	\$3,331.00
August I5	Shear	\$200.00	\$125.00			46	\$3,177.00
5.5	Total	\$265.00	\$166.00				
	\$	199	7 (year 10) Estimates				<u> </u>
May 5	Fertilize	\$65.00	\$39.00	'		114	\$3,226.00
August 15	Shear	\$200.00	\$119.00			44	\$3,070.00
	Total	\$265.00	\$158.00				
	**************************************	<b>‡99</b>	8 (year 11) Estimates	- HATA PENA	tangga wasan Nababahas,	Avel de Periode de la Contra de	
May 5	Fertilize	\$65.00	\$37.00			110	\$3,115.00
August 15	Shear	\$200.00	\$113.00			43	\$2,958.00
	Total	\$265.00	\$150.00				
		199	9 (year 12) Estimates	NAST WEST	attovining et elektric		la Madda (ca chaile i filibh ph
May 5	Fertilize	\$65.00	\$36.00			105	\$2,998.00
August 15	Shear	\$200.00	\$108.00	ı		42	\$2,840.00
November 15	Harvest 100%	\$500.00	\$267.00			35	\$2,375.00
November 15	Sell 100%			\$5,000.00	\$2,667.27		\$7,375.00
	Total	\$765.00	\$411.00	\$5,000.00	\$2,667.27		
Joseph Co.		200	0 (year 13) Estimates	113811144137		11:2-11:44:11	
December 31	Bank Balance				TO THE THE TOTAL PROPERTY OF THE PARTY OF TH	417	\$7,792.00
	Grand Total	\$3,849.00	\$2,733.00	\$5,000.00	\$2,667.27		

	in the spring of 1988.		7771 (4) (eccept) her) 4 (24) 44.	· 1830 · 中国 (1978年18月1日 1878年18月1日 1878年18年	- 1717354471447754(17)7	#\$\$\unidenter=17\$?;;#\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
			Cost	Royenue		
Date	Activity	Current	Discounted (5%)	Current Discoun (5%)	A School of the Control of Control of Control	\$4,000 Bank Account
1.		difficult (All Controls of Control of Controls of Control of Con	1988 (year 1)		#44154260-5141541-148 	Talanta (m. 1945) Talanta (m. 1965)
Jan. 1, 1987	Roads	\$200.00	\$200.00	THE PROPERTY OF THE PARTY OF TH		\$3,800.00
May 3, 1988	Planted balsam fir bareroot 2+2	\$570.00	\$534.00		256	\$3,486.00
June 3	Severe frost	ne	1			1
	Total	\$770.00	\$734,00		'	'
-(.):			1989 (year 2)	(35752710 <b>66</b> (5 <del>75</del> 884425866) (48666)	difficultification of the second	######################################
May 10	Fill planted approximately 100 balsam fir barcroot 2+2.	\$57.00			178	\$3,607.00
- 1	Total	\$57.00	\$0.00			
<u>.</u> Obs., 1000 (1919)		$([\{\psi(v)\},\psi],(j^2),[])$	1990 (year 3)			Mari (2001/00/06)
May 15	Fill planted balsam fir bareroot 2+3.	\$57.00		To the same of the	183	\$3,733,00
army	Total	\$57.00	\$41.00		·	
			1991 (year 4)		-1,418,51145,4475,000 65,458,5145,447,1111	digitaliya (digita. B
November 20	O Corrective shearing; tipped a few trees that had excessive leader growth, these were not used in the study.	nc				
	Total	1				- 44/m-mann yearn near - 1
			1992 (year 5)			$ \begin{array}{c} \left\{ \begin{array}{cccccccccccccccccccccccccccccccccccc$
June 17	Treated all trees for aphids: Diazinon - label rates.	\$50.00	\$38.00		401	\$4,084.00
October 8	Sheared all trees with long leaders (tipped).	ne				
	Total	\$50.00	\$30.00	120000000000000000000000000000000000000		
2 / 1/2 / 1/2 / 1/4			1993 (year 6)		jtilkillijiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	HEIDEN WARE
November 1	All appropriate trees were butt pruned and sheared.	. \$450.00	\$322.00		284	\$3,918.00
	Total	\$450.00	\$235.00			- Marian Indian
4. 4. <u>19</u> 70			1994 (year 7)		livitorei (thirine)	<u> </u>
August 17	Shearing, all blocks (Conventional methods)	\$200.00	\$138.00		154	\$3,872.00
	Total	\$200.00	97.00			
		19	995 (year 8) Estimate		/ Tries )   1   1   1   1   1   1   1   1   1	
May 5	Insecticide	\$50.00			137	\$3,959.00
August 15	Shear	\$200.00	0 \$131.00		55	\$3,814.00
	Total	\$250.00	0 \$164.00			_/45000000000000000000000000000000000000
		10	996 (year 9) Estimate	2 <b>5</b> (2) (2) (3) (4) (5) (6) (7) (6) (7)		
August 15	Shear	\$200.00	0 \$125.00		. 191	\$3,805.00
	Total	\$200.00	0 \$80.00			
The section is		19	997 (year 10) Estimate			
August 15	Shear	\$200.00			190	\$3,795.00
		\$200.00	0 \$73.00		1	1

\$113.00

\$66.00

\$200.00

\$200.00

August 15

Shear

Total

190

\$3,785.00

Appendix I. Block 7 & 8 - Control - Description of the cultural treatments and their associated current and discounted costs and revenues for a Christmas tree plantation planted in an abandoned field in the spring of 1988.

			Cost	R	venue	m(0.000)	geriletine
Date	Activity	Current	Discounted (5%)	Current	Discounted (5%)	Interest (\$)	\$4,000 Bank Account
***************************************		19	99 (year 12) Estimates		1-11-17-19-19-19-19-19-19-19-19-19-19-19-19-19-		
August 15	Shear	\$200,00	\$108.00			189	\$3,774.00
November 15	Harvest 88%	\$440.00	\$235.00			47	\$3,381.00
November 15	SeII 88%			\$4,400.00	\$2,347.19		\$7,781.00
	Total	\$640.00	\$343.00	\$4,400.00	\$2,347.19		
		20	00 (year 13) Estimates				//////////////////////////////////////
August 14	Shear	\$24.00	\$12.34			289	\$8,046.00
November 14	Harvest 12%	\$60,00	\$30.00			100	\$8,086.00
November 14	Sell 12%			\$600.00	\$304.83		\$8,686.00
	Total	\$84.00	\$42.34	\$600.00	\$304.83	ļ '	
December 31	Bank Balance					54	\$8,740.00
	Grand Total	\$3,158.00	\$2,239.00	\$5,000.00	\$2,652.03		

Appendix II. Estimated costs Christmas tree tr	and revenues for the Mount Thom rial.
Treatment	Treatment Cost and Revenues (1994) For 1 Acre (1,000 trees)
Roads	\$0.20/tree * 1000
Rotovate	2 hours * \$25,00/hour
Lime (purchase + spread)	4.01 tons * \$26.15/ton
Rotovate (incorporation)	1 hour * \$25.00/hour
Cover crop seeding (purchase + spread + roll)	(I hour * \$25.00/hour) + (\$2.60/lb * 15 lbs)
Fertilizer 25-5-5 at 250 lbs/acre	\$365.00/ton * 250 lbs
Herbicide application for rows	, \$.10/trec * 1000
Stock acquisition: Balsam Fir	\$.45/tree * 1000
Planting	\$0.12/tree * 1000
Fill Plant (estimate 20%)	20% * 1000 trees * \$0.57/tree
Herbicide (all years)	\$0.10/tree * 1000 trees* each application
Fertilize (none first year)	\$0.0625/tree * 1000 trees* each application
Insecticide (estimate 2 times)	\$0.05/tree * 1000 trees* each application
Mowing (3 times/year)	\$25.00/acre * 3/year
Butt Pruning	\$0.25/tree * 1000 trees
Shearing (none first 5 years)	\$0.20/tree * each application
Harvest (Cut + drag)	\$0.50/tree * 1000
Revenue: Heavy Medium Light	\$ 10.75 \$ 8.25 \$ 5.00

			;		
Forest Planning and Research Section					
Forestry Division		,			
Nova Scotia Department of Natural Res	ources				
P.O. Box 68, Truro, Nova Scotia, Canad	a B2N 5B8				
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