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**DETERMINING THE COSTS
OF REMOVING AND REPLACING
DEAD OR DAMAGED
COMMERCIAL FRUIT TREES**

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COMMERCIAL FRUIT TREES DEAD OR DAMAGED OF REMOVING AND REPLACING DETERMINING THE COSTS

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DETERMINING THE COSTS OF REMOVING AND REPLACING
DEAD OR DAMAGED COMMERCIAL FRUIT TREES

by

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INTRODUCTION

Orchardists occasionally have to replace one or more fruit trees that were severely damaged or killed by fire, chemicals, mechanical injury, water erosion, pathological problems, or animals. When that happens, orchard owners have difficulty determining the extent of loss for insurance or tax claims or for other purposes.

This publication presents an orderly procedure for determining the cost of removing and replacing a small number of commercial fruit trees in an orchard, and the reduced income due to loss of the tree or trees. An example of the procedure is used for illustration purposes. Worksheets are also provided for individuals wanting to determine the impact of tree loss in their orchard.

The procedure presented herein is designed for those situations where a small number of trees in a planting block need to be replaced. It is not suitable for determining the costs associated with 1) loss of a sufficiently large number of trees that an entire block has to be replanted, 2) removal of part of an orchard for other land use, 3) tree injury that results in crop loss for only a few years, or 4) tree injury that results in weakened trees or partial loss of trees.

The principal cost factors that need to be considered when removing and replacing a small number of fruit trees include 1) removing and replacing the dead or damaged tree(s), 2) the added care required to establish comparable trees, 3) reduced production and harvest costs due to loss of the previous tree(s), 4) determining the annual income the damaged or dead tree(s) would have provided during their normal life, and 5) determining the income from the replants.

While these costs and loss of income will occur over many years, the orchardist usually has to determine the impact of his loss quite soon. Thus, he must determine the present value of costs and loss of income that will occur many years into the future.

CAUTION: Data in the following tables are for illustration purposes only. They were included solely to show use of the procedure. They should not be used as a "thumb rule" of the loss for trees of the type and age indicated. Each orchard damage situation must be evaluated on its own merits.

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TREE REMOVAL AND REPLACEMENT COSTS

Orchardists normally remove and replace a small number of dead or severely damaged trees within one year. In the event of extensive soil removal or damage (due to water erosion, chemicals, etc.) however, it may be two or more years before the trees are replanted.

The example illustrates use of the procedure for an orchard situation where five trees were damaged by fire and had to be replaced. They were 10-year semi-dwarf Red Delicious trees spaced 10 feet apart in 20 foot rows. Table 1 summarizes the labor, machinery and material costs for removing and replacing the affected trees and making other necessary orchard repairs.

A. Removal of Damaged Trees

The work required to remove the trees depends on the size of the roots and diameter of the trunk. It normally takes less than thirty minutes to remove and replant trees that are less than five years old, and requires very little machinery expense. However, it may be necessary to use a bulldozer and backhoe to remove large trees.

The example in Table 1 shows 3.0 hours of labor to remove five trees, or 36 minutes for each tree. At a labor rate of \$3.00 per hour, that amounts to \$1.80 per tree. The example further indicates 1.5 hours of machinery use, costing \$1.05 per tree. That amount does not include machinery ownership costs because they do not change with increases in machine use.

B. Preparing the Site for Replacing Trees

Other pre-plant operations also depend on the age and size of the tree(s) being replaced. Plantings with trees less than five years old generally require little or no pre-plant operations after tree removal. But some older planting sites require replacement of soil that is not suitable for young trees.

Section B shows site preparation costs of \$2.40 per tree, which was based on 2.0 hours of labor and 1.0 hour of machinery time to obtain new soil and place it in the old root zone area.

C. Tree Replacement

Tree purchase is a major replant cost. Other costs include digging the hole, planting the tree, and watering it. The illustration shows trees costing \$2.75 each, and \$0.72 per tree for planting.

D. Repairing Other Damages

Other costs may include repair of the irrigation system, orchard trellis, buildings, field equipment, roads, etc. Such repairs are normally made within a year, so those cost estimates are readily obtained. But it may take several years to rebuild a severe soil erosion condition to where the land is suitable for fruit trees.

TABLE 1. TREE REMOVAL AND REPLACEMENT COST^{1/}

	<u>Total</u> \$	<u>\$/Tree</u>
A. Removal of _____ Tree(s)		
<u>3.0</u> hours labor @ \$ <u>3.00</u> per hour ^{2/}	<u>9.00</u>	<u>1.80</u>
<u>1.5</u> hours machinery @ \$ <u>3.50</u> per hour (include such machinery operating costs as fuel, repairs, etc.)	<u>5.25</u>	<u>1.05</u>
B. Prepare Site for Replacing Tree(s)		
<u>2.0</u> hours labor @ \$ <u>3.00</u> per hour	<u>6.00</u>	<u>1.20</u>
<u>1.0</u> hours machinery @ \$ <u>3.00</u> per hour (machinery operating costs only)	<u>3.00</u>	<u>.60</u>
materials (soil, etc.): <u>Soil</u>	<u>3.00</u>	<u>.60</u>
C. <u>5</u> tree(s) @ \$ <u>2.75</u> per tree (include transportation, storage, etc.)	<u>13.75</u>	<u>2.75</u>
replant (include digging holes and planting)		
<u>1.0</u> hours labor @ \$ <u>3.00</u> per hour	<u>3.00</u>	<u>.60</u>
<u>.25</u> hours machinery @ \$ <u>2.50</u> per hour (machinery operating costs only)	<u>.62</u>	<u>.12</u>
materials: <u>None</u>	<u>0</u>	<u>0</u>
D. Repair Other Damages ^{3/}		
_____ hours labor @ \$ _____ per hour	<u>0</u>	<u>0</u>
_____ hours machinery @ \$ _____ per hour	<u>0</u>	<u>0</u>
materials and other <u>None</u>	<u>0</u>	<u>0</u>
<hr/>		
TOTAL REMOVAL AND REPLACEMENT COSTS	<u>43.62</u>	<u>8.72</u>

^{1/}Assumes trees replaced within one year.^{2/}Hourly labor rate should include cash or non-cash wages and such other labor-related expenses as Social Security, other labor insurance, travel and housing allowances, etc.^{3/}Damages to irrigation system, buildings, equipment, roads, etc.

ADDED COSTS TO ESTABLISH REPLACEMENT TREES

Replant trees require special care until they become established, but that care usually costs less than for older trees in the block. Thus, it is necessary to separate the costs of caring for replants from the costs of caring for older trees. In Table 2 we identify only the added costs to care for the replants until they reach the production stage.

Pruning and Training: The replant trees are usually pruned at least once during the first year. The illustration in Table 2 shows a labor cost of \$1.50 for summer pruning, for 30 minutes labor, but no machinery or material costs. The second year pruning costs are estimated at \$1.00 for the five trees. There should not be any added machinery or material costs that year.

Some young trees require special training as well as pruning, i.e., tying limbs, applying spreaders, etc. These operations are normally started in the third or fourth year. Table 2 shows \$1.50 pruning and training costs for the third and fourth years, based on 30 minutes for each year. Spreader costs are shown to be 75 and 80 cents, respectively.

Spur type Red Delicious trees are normally large enough to produce fruit in the fifth year. The pruning costs will then be about the same as for other trees in the block, so there would be no more added pruning and training costs.

Weed Control: Orchardists normally hand weed around newly planted trees. The first-year weeding costs of \$2.50 assume ten minutes labor per tree. A weed control chemical was applied around the replants in their second year; therefore, there would be no more added weed control costs.

Irrigation: Newly planted trees require extra irrigations for at least one year. It may be necessary to haul water to them, which could require as much as one hour per irrigation. Table 2 shows a \$9.00 irrigation labor charge during the first year, and \$4.12 for machinery use.

Other Added Costs: Most other cultural practices would be conducted in the same manner as for the entire block, i.e., cultivating, spraying, rodent control, etc. The illustration in Table 2, therefore, shows no other added costs for establishing the replacement trees.

Total Added Costs: Since the added costs of establishing the replants are spread over several years, it is necessary to determine the present value of those costs. Their present value is determined by discounting the annual amounts, and then adding those discounted values. The present value (discount) table in Appendix Table 1 is used for calculating the present value of future income and expenses for selected years of time and annual discount rates.^{a/}

Table 2 shows an added first-year expense of \$17.12, which has a present value of \$17.12. However, the third year charge of \$2.25 was discounted to \$1.89.

^{a/} See discussion of present value (discount) concepts on Page 14.

TABLE 2. ADDED COSTS REQUIRED TO ESTABLISH REPLACEMENT TREES^{1/}

	Year										Total
	1	2	3	4	5	6	7	8	9	10	
Estimated yield - (field weight in pounds) by variety and strain <u>5 spur Reds</u>	0	0	0	0	100	350	525	700	875	1000	
Prune, train: labor	1.50	1.00	1.50	1.50							
machinery @ \$ ___ per hour											
materials <u>spreaders</u>			.75	.80							
Weed control: labor @ \$ ___ per hour	2.50										
machinery @ \$ ___ per hour											
materials _____											
Irrigation: labor @ \$ <u>3.00</u> per hour	9.00										
machinery @ \$ <u>2.15</u> per hour	4.12										
other _____											
Cultivation: labor @ \$ ___ per hour											
machinery @ \$ ___ per hour											
materials _____											
Pest control: labor @ \$ ___ per hour											
machinery @ \$ ___ per hour											
materials _____											
_____ : labor @ \$ ___ per hour											
machinery @ \$ ___ per hour											
other _____											
_____ : labor @ \$ ___ per hour											
machinery @ \$ ___ per hour											
other _____											
TOTAL ADDED COSTS	17.12	1.00	2.25	2.30							
ANNUAL DISCOUNT FACTOR (9%) (See Appendix Table 1)	1.000	.917	.842	.772							
PRESENT VALUE OF ADDED COSTS	17.12	.92	1.89	1.78							21.71

^{1/} Include costs for years required to establish replacement tree(s) to age of previous tree or to bearing age of replacement(s), whichever comes first.

REDUCTION IN PRODUCTION AND HARVEST COSTS

The costs of some orchard operations can vary by tree type, age, and crop yield, i.e., picking, thinning, etc. Therefore, reduction in the production and harvest costs due to removal and replacement of one or more trees can vary. Table 3 shows how to determine the annual cost reductions for the years required to bring replant trees into production or to the age of the previous trees, whichever comes first.

Annual Yield Loss

Most orchardists know the age, condition and approximate yield of trees in their orchard. Too, they can closely project a yield for those trees for several years into the future.

In the first part of Table 3, record the anticipated annual loss of fruit (in pounds) from the trees that were removed. As in Table 2, that amount should be only until the replants start producing fruit.

Reduced Pruning Costs

Since total pruning costs for the replants were listed in Table 2, it is necessary to enter in Table 3 the entire amount of reduced pruning costs for the removed trees. Table 3 shows the pruning charges would have been 75 cents per tree; that amount was based on current pruning costs for trees of that type and size.

Hand Thinning

Except for cherries, most fruit trees require some hand thinning. Although the amount will vary from year to year, and by type of tree, it is closely related to tree size, vigor and annual crop load.

As a general rule, apple thinning costs currently range from 7 to 10 cents per box of fruit harvested. The thinning costs shown in Table 3 were based on a charge of 8 cents per 35-pound field box.

Picking, Swamping and Hauling

Since picking and swamping costs are based on the amount of fruit produced, the reduction in costs can be quite readily determined. In the example, the reduction in picking costs was based on a picking charge of 26 cents per box, or \$7.40 for 1,000 pounds. The swamping charges assume a custom rate of \$1.00 per 25-box bin while the hauling charges assumed a custom rate of \$2.00 per bin.

Other Costs

When only a few trees are replaced, there will seldom be any reduction in such cultural costs as irrigating, cultivating, weed control and spraying. Most of those operations are for all land and trees in a row regardless of tree size.

Total Annual Reduced Costs

It is again necessary to discount the reduced production and harvest costs to arrive at their present value.

TABLE 3. REDUCED PRODUCTION AND HARVEST COSTS DUE TO LOSS OF PREVIOUS TREES^{1/}

	Year										Total
	1	2	3	4	5	6	7	8	9	10	
Annual yield loss (field weight in pounds) by variety and strain <u>5 spur Reds</u>	1000	1100	1200	1300	1300	1300	1300	1200	1100	1000	
Pruning: labor ^{2/} machinery @ \$ ___ per hour ^{3/}	3.75	3.75	3.75	3.75							
Thinning: labor @ <u>8¢</u> per box OR ___ per lb. materials _____	2.30	2.50	2.75	3.00							
Picking: \$ <u>.26</u> per box or \$ ___ per lb.	7.40	8.15	8.90	9.65							
Swamping: labor @ \$ ___ per hour machinery @ \$ ___ per hour OR: \$ <u>.04</u> per box custom rate	1.15	1.25	1.35	1.50							
Hauling: labor @ \$ ___ per hour machinery @ \$ ___ per hour OR \$ <u>.08</u> per box custom rate	2.30	2.50	2.70	3.00							
Other: labor @ \$ ___ per hour machinery @ \$ ___ per hour materials _____											
Other: labor @ \$ ___ per hour machinery @ \$ ___ per hour materials _____											
TOTAL REDUCED COSTS	16.90	18.15	19.45	20.90							
ANNUAL DISCOUNT FACTOR (9%)	1.000	.917	.842	.772							
PRESENT VALUE OF REDUCED COSTS	16.90	16.64	16.38	16.13							66.05

1/ Include cost reductions for years required to establish replacement tree(s) to age of previous tree(s) or to bearing age of replants, whichever would occur first.
 2/ Include such associated costs as labor insurance, transportation, housing, etc.
 3/ Include only such variable machinery costs as fuel, oil, repairs.

PROJECTED LOSS OF INCOME FROM REPLACED TREES

The cultural practices required to remove and replace the damaged trees, and the associated costs, have now been calculated. The next step is to determine the projected crop yield and annual income of the trees that were lost and of their replacements. Table 4 was designed to identify the projected income loss from the damaged (replaced) trees. Table 5 is then used to anticipate future income from the replants.

Anticipated Yield Loss

Orchardists usually replace damaged trees with ones of the same type. Therefore, we can expect that the damaged trees and the replants will produce about the same fruit volume and grade at any given age.

The first step in Table 4 is to project the fruit volume and grade the removed trees should have produced until the replants reach that same level of production (both quantity and grade) or until the entire planting is expected to be renovated, whichever occurs first. Those estimates should be based on local data from comparable plantings at various ages.

Table 4 shows the projected crop yield and grade for the damaged trees during the next 10 years. At that age, the replants are expected to yield approximately the same as the remaining trees in the block.

Fruit Grade

Fruit grading systems vary with type of fruit and whether the product is for fresh market sales or processing. Table 4 was designed to allow separating the fruit into three grades, but can be expanded for more grade categories.

For each grade, it is necessary to specify the amount of fruit and its estimated value as delivered to the packing house or storage facility. In the example, the fruit produced was separated into three fresh market grades.

The projected value was based on an expected long-term average grower returns of \$2.75 for Extra Fancy apples, \$1.49 for Fancy grade, and no income from the culls. Many packing houses do not pay growers for the culls they produce.

Loss of the Annual Sales

The projected loss of annual sales is a sum of the expected income for each grade. In the example the annual sales loss was projected to be \$51.05 for the first year, increasing to \$66.31 for the fourth year.

Reduced Production and Harvest Costs

Many costs in a bearing orchard block occur regardless of the yield on individual trees. But the costs for thinning, propping, and harvest will vary for individual trees, as they are related to the fruit load. In the example, the estimated thinning costs were based on a charge of 8 cents per field box (35 pounds). Spur type Delicious do not usually need propping, so no costs were included. Harvest costs were based on 26 cents per field box for picking, 4 cents for swamping, and 8 cents for hauling fruit to the packing house.

Projected Annual Loss of Income

The projected annual loss of income is determined by subtracting the expected thinning, propping and harvest costs from projected crop sales. That annual income loss must then be discounted to determine its present value.

TABLE 4. PROJECTED LOSS OF INCOME FROM REPLACED TREES

Years Since Trees Destroyed	Anticipated Yield Loss In Pounds (Field Wt.)	XF Grade			Fancy Grade			Cull Grade			Projected Loss of Annual Sales	Thinning Costs at <u>8¢/35#</u>	Propping Costs at /	Harvest and Hauling Costs at <u>38¢/35#</u>	Projected Annual Loss of Income	Discount Factor at <u>9</u> %	Present Value of Income Loss
		Percent of Crop	Pounds (Field Wt.)	Value at <u>2.12/42#</u>	Percent of Crop	Pounds (Field Wt.)	Value at <u>1.99/42#</u>	Percent of Crop	Pounds (Field Wt.)	Value at /							
1	1000	65	650	42.55	24	240	8.50	11	110	0	\$ 51.05	\$ 2.30	\$ —	\$ 10.85	\$ 37.90	1.000	\$ 37.90
2	1100	65	715	46.81	24	263	9.40	11	120	0	56.21	2.50	—	11.95	41.76	.917	38.29
3	1200	65	780	51.07	24	290	10.28	11	130	0	61.35	2.75	—	13.00	45.60	.842	38.40
4	1300	65	845	55.32	24	310	10.99	11	145	0	66.31	3.00	—	14.10	49.21	.772	37.99
5	1300	65	845	55.32	24	310	10.99	11	145	0	66.31	3.00	—	14.10	49.21	.708	34.80
6	1300	65	845	55.32	24	310	10.99	11	145	0	66.31	3.00	—	14.10	49.21	.650	31.99
7	1300	65	845	55.32	24	310	10.99	11	145	0	66.31	3.00	—	14.10	49.21	.596	29.53
8	1200	65	780	51.07	24	290	10.28	11	130	0	61.35	2.75	—	13.00	45.60	.547	24.94
9	1100	65	715	46.81	24	263	9.40	11	120	0	56.21	2.50	—	11.95	41.76	.502	20.96
10	1000	65	650	42.55	24	240	8.50	11	110	0	51.05	2.30	—	10.85	37.90	.460	17.42
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
Total															447.36		312.03

PROJECTED INCOME FROM REPLACEMENT TREES

The data assembled for the replanted trees, in Table 5, is quite similar to that in Table 4. Therefore, little additional instruction should be needed to determine the needed information. However, growers are cautioned to carefully consider their yield and grade expectations for trees starting production.

Anticipated Annual Yields

The age that a tree starts producing fruit, and the annual increase during the early bearing years, will vary upon the type and strain of trees planted as well as on the soil and climatic conditions in the orchard, and on such orchard management practices as pruning and training, irrigation, fertilization, weed and rodent control, etc.

For the example in Table 5, the following annual yields were projected:

<u>Year</u>	<u>Pounds per Tree</u>	<u>Boxes per Tree (Field Weight)</u>
4	0	0
5	20	.57
6	70	2.70
7	105	3.00
8	140	4.00
9	175	5.00
10	200	5.71

Fruit Quality

Some young fruit trees in a vigorous growing stage do not produce high quality fruit for one or more years. The fruit may be unusually large or misshapen, and may not be of sufficient internal quality for lengthy storage. Such fruit is often diverted into processing market channels rather than sold on the fresh market.

In the example in Table 5, the apples produced in the fifth and sixth years are to be sold to a processor; they are valued at \$60 per ton. Although it is expected the fruit will be suitable for fresh market sales in subsequent years, it is not expected the normal fruit quality level will be achieved until the sixth year of fruit production.

TABLE 5. PROJECTED INCOME FROM REPLACEMENT TREES

Years Since Trees Destroyed	Anticipated Yield in Pounds (Field Wt.)	XF Grade			Fancy Grade			Cull Grade			Projected Annual Crop Sales	Thinning Costs at 8¢/35¢	Propping Costs at /	Harvest and Hauling Costs at 5¢/55¢	Projected Annual Loss of Income	Discount Factor at 9%	Present Value of Income Loss
		Percent of Crop	Pounds (Field Wt.)	Value at \$2.75/42	Percent of Crop	Pounds (Field Wt.)	Value at \$1.27/42	Percent of Crop	Pounds (Field Wt.)	Value at \$607							
1	0	%		\$	%		\$	%		\$	\$	\$	\$	\$		1.000	\$ 0
2	0															.917	0
3	0															.842	0
4	0															.772	0
5	100	0	0	0	0	0	0	100	100	3.00	3.00	0	-	1.10	1.90	.708	1.34
6	350	0	0	0	0	0	0	100	350	10.50	10.50	.80	-	3.80	5.90	.650	3.84
7	525	30	155	10.14	45	235	8.33	25	0	0	18.47	1.20	-	5.70	11.57	.596	6.90
8	700	45	315	20.62	40	280	9.93	15	0	0	30.55	1.60	-	7.60	21.35	.547	11.68
9	875	60	525	34.37	27	235	8.33	13	0	0	42.70	2.00	-	9.50	31.20	.502	15.66
10	1000	65	650	42.55	24	290	8.50	11	0	0	51.05	2.30	-	10.85	37.90	.460	17.43
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
Total																109.82	56.85

SUMMARY OF REMOVAL AND REPLACEMENT COSTS

When the preceding tables have been completed, the data can be summarized in Table 6 to determine the present value of the costs and loss of income due to removing and replacing one or more trees in an orchard block.

A. Tree Replacement Costs

The tree removal and replacement costs in Table 1 also include labor, machinery and material costs for repairing the irrigation system, equipment and buildings, roads, etc.

B. Present Value of Added Establishment Costs

The added costs of establishing replants, determined in Table 2, recognize that special care is needed. The care will vary with the type and age of other trees in the block, type and age of the replants and general orchard operations.

C. Present Value of Reduced Production and Harvest Costs

The reduced production and harvest costs identified in Table 3 may be very small for a young non-bearing tree, but can be quite large for a tree producing 10 boxes or more of high quality apples.

D. Loss of Income from Damaged (Replaced) Tree

The data in Table 4 shows the expected loss of income from the damaged trees. It was determined by subtracting such crop-related expenses as thinning, propping and picking from expected annual crop sales.

E. Projected Income from Replanted Trees

In Table 5, the projected annual income from the replant trees were determined. The amount calculated in Table 5 will vary with the years required to bring the tree(s) into production, and the expected crop yield and value.

F. The Risk Factor

There are several types of risk associated with planting and establishing replants in an orchard block. They include such factors as acquisition of suitable rootstock, proper planting procedures, local climatic conditions, adequate care after planting, etc. The tree mortality rate on replants can range from less than 5 to over 50 percent. For the illustration, a 25 percent mortality rate was assumed. On that basis, the risk factor was determined to be 25 percent of the replant costs (\$0.87 per tree) plus 25 percent of the establishment costs (\$1.08 per tree).

TABLE 6. SUMMARY OF COSTS OF REMOVING AND REPLACING DAMAGED FRUIT TREES

	<u>Total</u>	<u>Per Tree</u>
A. Tree replacement costs (from Table 1).	<u>4362</u>	<u>8.72</u>
B. Plus present value of added establishment costs (from Table 2).	<u>+ 21.71</u>	<u>+ 4.34</u>
C. Minus present value of reduced costs (from Table 3).	<u>- 66.05</u>	<u>- 13.21</u>
D. Plus projected loss of income from replaced trees (from Table 4).	<u>+ 312.03</u>	<u>+ 62.41</u>
E. Minus projected income from replacement trees (from Table 5)	<u>- 56.85</u>	<u>- 11.37</u>
F. Equals subtotal (sum of above items)	<u>253.46</u>	<u>50.89</u>
G. Plus risk factor (<u>25%</u> of Item C in Table 1 plus <u>25%</u> of item "B" above).	<u>+ 9.77</u>	<u>+ 1.95</u>
H. Equals expected Present Value of Costs of Removing and Replacing Tree(s). (Sum of items F and G)	<u>263.23</u>	<u>52.84</u>

Some Limitations of this Analysis Procedure

As previously stated, this analysis procedure was designed for those situations where only a limited number of trees in an orchard block are replaced. It is not suitable for determining the costs associated with:

1. loss of a sufficiently large number of trees that an entire block has to be replanted,
2. removal of part of an orchard for other land use,
3. tree injury of a temporary nature that results in crop loss for only a few years,
4. tree injury that results in permanently weakened trees or permanent loss of portions of trees.

Additionally, the procedure does not consider any tax impacts associated with removing and replacing trees. The expected present value of costs are on a before-tax basis.

Finally, the proposed procedure considers only the time period for the expected life of the original planting; it assumes that all trees in the orchard block will be removed at the end of that time. Therefore, it does not properly reflect the costs for those orchard situations where the orchard block is renovated by interplanting young trees in an older planting.

Appendix Table 1. Present Value (Discount) Table

Year	7.5%	8.0%	8.5%	9.0%	9.5%	10.0%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	.9302	.9259	.9217	.9174	.9132	.9091
3	.8653	.8573	.8494	.8417	.8340	.8364
4	.8050	.7938	.7829	.7722	.7616	.7513
5	.7488	.7350	.7216	.7084	.6958	.6830
6	.6966	.6806	.6650	.6499	.6352	.6309
7	.6480	.6302	.6129	.5963	.5801	.5645
8	.6028	.5835	.5650	.5470	.5297	.5132
9	.5607	.5403	.5206	.5019	.4838	.4665
10	.5216	.5002	.4798	.4604	.4418	.4241
11	.4852	.4632	.4423	.4224	.4035	.3855
12	.4513	.4289	.4077	.3875	.3685	.3507
13	.4199	.3971	.3757	.3555	.3365	.3186
14	.3906	.3677	.3463	.3262	.3073	.2897
15	.3633	.3405	.3192	.2992	.2807	.2633
16	.3380	.3152	.2941	.2745	.2563	.2394
17	.3144	.2919	.2711	.2519	.2341	.2176
18	.2925	.2703	.2499	.2311	.2138	.1978
19	.2720	.2502	.2303	.2120	.1952	.1799
20	.2531	.2317	.2122	.1945	.1783	.1635

Present Value or Discounting Concepts

To properly consider the impact of costs or income that occur over more than one year, it is necessary to recognize the time value of money. Many people avoid "time value" concepts although they are not really difficult to understand.

Suppose a person owed you \$1,000 which is due one year from today, but said we wanted to pay the debt now. How much would you settle for? If you could invest the amount you received today in an insured savings account that earned 8 percent interest, you could settle for \$925.93. At the end of the year of savings you would have earned \$74.07 interest on that savings, leaving you with \$925.93 plus \$74.07, or \$1,000. This concept applies to either income or expenses, and for any number of years. The present value of an amount (income or expense) that occurs at some future date decreases as that date is extended and as the discount rate increases.

The most critical part of discounting is determining the appropriate annual discount rate. Most people realize that long-term interest rates are often adjusted to compensate for risk and inflation factors as well as for the possible rates of return on no-risk alternative investments. The same is true for discount rates. In discounting, one should use an annual discount rate which is approximately equal to the interest rate on best available investments with similar risk.

WORK SHEET TABLES

WORKSHEET 1. TREE REMOVAL AND REPLACEMENT COST^{1/}

	<u>Total</u>	<u>\$/Tree</u>
A. Removal of ___ Tree(s)		
___ hours labor @ \$ ___ per hour	_____	_____
___ hours machinery @ \$ ___ per hour (Include such machinery operating costs as fuel, repairs, etc.)	_____	_____
B. Prepare Site for Replacing Tree(s)		
___ hours labor @ \$ ___ per hour	_____	_____
___ hours machinery @ \$ ___ per hour (Machinery operating costs only)	_____	_____
materials (soil, etc.): _____	_____	_____
C. Tree Replacement		
___ tree(s) @ \$ ___ per tree (include transportation, storage, etc.)	_____	_____
replant (include digging holes and planting)		
___ hours labor @ \$ ___ per hour	_____	_____
___ hours machinery @ \$ ___ per hour (machinery operating costs only)	_____	_____
materials: _____	_____	_____
D. Repair Other Damages ^{2/}		
___ hours labor @ \$ ___ per hour	_____	_____
___ hours machinery @ \$ ___ per hour	_____	_____
materials and other _____	_____	_____
_____	_____	_____
TOTAL REMOVAL AND REPLACEMENT COSTS	=====	=====

^{1/} Assumes trees replaced within one year.

^{2/} Hourly labor rate should include cash or non-cash wages and such other labor-related expenses as Social Security, other labor insurance, travel and housing allowances, etc.

^{3/} Damages to irrigation system, buildings, equipment, roads, etc.

WORKSHEET 2. ADDED COSTS REQUIRED TO ESTABLISH REPLACEMENT TREES^{1/}

	Year										Total	
	1	2	3	4	5	6	7	8	9	10		
Estimated yield - (field weight in pounds) by variety and strain _____ _____ _____												
Prune, train: labor machinery @ \$____ per hour materials _____												
Weed control: labor @ \$____ per hour machinery @ \$____ per hour materials _____												
Irrigation: labor @ \$____ per hour machinery @ \$____ per hour other _____												
Cultivation: labor @ \$____ per hour machinery @ \$____ per hour materials _____												
Pest Control: labor @ \$____ per hour machinery @ \$____ per hour materials _____												
_____: labor @ \$____ per hour machinery @ \$____ per hour other _____												
_____: labor @ \$____ per hour machinery @ \$____ per hour other _____												
TOTAL ADDED COSTS												
ANNUAL DISCOUNT FACTOR (See Appendix Table 1)												
PRESENT VALUE OF ADDED COSTS												

^{1/} Include costs for years required to establish replacement tree(s) to age of previous tree or to bearing age of replacement(s), whichever comes first.

WORKSHEET 3. REDUCED PRODUCTION AND HARVEST COSTS DUE TO LOSS OF PREVIOUS TREES^{1/}

	Year										Total	
	1	2	3	4	5	6	7	8	9	10		
Annual yield loss (field weight in pounds) by variety and strain _____ _____												
Pruning: labor ^{2/} machinery @ \$____ per hour ^{3/}												
Thinning: labor @ ____ per box OR ____ per lb. materials _____												
Picking: \$____ per box or \$____ per lb.												
Swamping: labor @ \$____ per hour machinery @ \$____ per hour OR: \$____ per box custom rate												
Hauling: labor @ \$____ per hour machinery @ \$____ per hour OR: \$____ per box custom rate												
Other: labor @ \$____ per hour machinery @ \$____ per hour materials _____												
Other: labor @ \$____ per hour machinery @ \$____ per hour materials _____												
TOTAL REDUCED COSTS												
ANNUAL DISCOUNT FACTOR												
PRESENT VALUE OF REDUCED COSTS												

1/ Include cost reductions for years required to establish replacement tree(s) to age of previous tree(s) or to bearing age of replants, whichever would occur first.
 2/ Include such associated costs as labor insurance, transportation, housing, etc.
 3/ Include only such variable machinery costs as fuel, oil, repairs.

WORKSHEET 4. PROJECTED LOSS OF INCOME FROM REPLACED TREES

Years Since Trees Destroyed	Anticipated Yield Loss In Pounds (Field Wt.)	Grade			Grade			Grade			Projected Loss of Annual Sales	Thinning Costs at ___/___	Propping Costs at ___/___	Harvest and Hauling Costs at ___/___	Projected Annual Loss of Income	Discount Factor at ___%	Present Value of Income Loss
		Percent of Crop	Pounds (Field Wt.)	Value at ___/___	Percent of Crop	Pounds (Field Wt.)	Value at ___/___	Percent of Crop	Pounds (Field Wt.)	Value at ___/___							
				\$			\$			\$	\$	\$	\$	\$			\$
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
Total																	

WORKSHEET 5. PROJECTED INCOME FROM REPLACEMENT TREES

Years Since Trees Destroyed	Anticipated Yield in Pounds (Field Wt.)	Grade			Grade			Grade			Projected Annual Crop Sales	Thinning Costs at ___/___	Propping Costs at ___/___	Harvest and Hauling Costs at ___/___	Projected Annual Loss of Income	Discount Factor at _____%	Present Value of Income Loss
		Percent of Crop	Pounds (Field Wt.)	Value at ___/___	Percent of Crop	Pounds (Field Wt.)	Value at ___/___	Percent of Crop	Pounds (Field Wt.)	Value at ___/___							
				\$			\$			\$	\$	\$	\$	\$		\$	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
Total																	

WORKSHEET 6. SUMMARY OF COSTS OF REMOVING AND REPLACING DAMAGED FRUIT TREES

	<u>Total</u>	<u>Per Tree</u>
A. Tree replacement costs (from Table 1).	_____	_____
B. Plus present value of added establishment costs (from Table 2).	_____	_____
C. Minus present value of reduced costs (from Table 3).	_____	_____
D. Plus projected loss of income from replaced trees (from Table 4).	_____	_____
E. Minus projected income from replacement trees (from Table 5).	_____	_____
F. Equals subtotal (sum of above items).	_____	_____
G. Plus risk factor (____% of Item C in Table 1 plus ____% of item "B" above).	_____	_____
H. Equals expected present value of costs of removing and replacing tree(s). (Sum of items "F" and "G" above).	=====	=====

