

Estimating the Loss of Income from a Destroyed or Damaged Fruit Tree

When a fruit tree is lost due to unnatural causes, growers are often confused about how to estimate the future dollars lost from that tree. The grower may claim the tree is worth \$1,500 to \$3,000, while the insurance company or individual who is paying for the damage is willing to pay only \$6.50, the cost of a new tree. The grower and the person paying for the damage must recognize that the grower has lost income from the time the tree was destroyed or damaged to the time when a new tree is planted and comes into production with the same yield, fruit size, and quality as the lost tree.

A very good detailed report is illustrated in the publication "Determining The Costs of Removing and Replacing Dead or Damaged Commercial Fruit Trees," EM 4298, November, 1977 from Washington State University. Using the Washington State University publication format is also useful if a large number of trees are destroyed or damaged. However, the procedure used in the Tree Loss Calculator takes a simpler approach to give growers a "ballpark" figure that is very applicable in most cases. This report and an example below explain the steps involved in estimating the lost income from losing a fruit tree when it is destroyed or damaged.

In this situation, the grower actually loses a stream of future net incomes (annual gross income minus all production and harvesting costs) from the destroyed or damaged tree for a period of time. There are five variables to recognize and establish before starting the process of estimating the dollar loss. They are: 1) the loss of future yields from the destroyed or damaged tree; 2) the yield estimates of the new tree until the yield, fruit size, and quality reaches that of the destroyed or damaged tree; 3) future fruit prices; 4) future harvesting costs; and 5) an appropriate discount rate.

First, the grower must project the future loss in production from the destroyed or damaged tree and the future yields of a new tree. Assistance from past records or university studies may be a good place to start. However, projecting future yield losses should not be based on only one or two years' data. An average of past production may be a good indicator for the future. Secondly, estimating future fruit prices is also very difficult. Again, using the best price of any one year is not suggested, but a five-year average is a good starting point. Thirdly, estimating future harvesting costs can be fairly straightforward by using the current costs of production and harvesting. Finally, a discount rate must be chosen for future payments received in today's dollars. This concept is hard to grasp and understand but is a necessary part of the analysis. Instead of making a payment to a grower each year for the lost income, one payment is made today for future net incomes at a discounted dollar amount. Moreover, if the grower could invest this discounted dollar amount in a savings account, compounded annually, at the same rate as the discount rate and withdraw the amount of projected net income lost for each year, the ending balance of the savings account would be \$0. In other words, the grower will receive a payment today less than the total future dollars, but the interest received in a savings account on the payment will compensate

the grower for the appropriate dollar loss. It might be useful to think about discounting as the opposite of compounding an interest rate to an amount of money.

To better explain the process, we'll use an example of a 30-year-old Bing sweet cherry tree that accidentally jumped in front of a vehicle and was destroyed. During the past five years, the tree produced an average of 100 pounds of fresh cherries per year, and the 5-year average price for fresh sweet cherries is \$0.90 per pound. The replacement tree will come into production in 5 years and reach full production in 12 years, producing 10, 20, 40, 60, 70, 80, 90, 100 pounds of cherries, respectively.

A backhoe will remove the destroyed tree, and the grower will use a tractor and auger to plant the new tree. A backhoe is hired for ½ hour at a cost of \$45 per hour; 1 hour of labor at \$10.00 per hour is used to remove and replace the new tree. The grower will receive \$10.00 per hour for 1 hour to use the tractor and auger to plant the new tree. A new tree will cost \$7.00. It's likely these tasks are performed soon after the accident, and the costs are usually calculated in today's dollars. As shown in Table 1 below, a payment of \$49.50 will be paid to the grower for tree removal, cost of a new tree, and planting the new tree.

Table 1. Removing and Replacing a Dead or Damaged Tree(s).

	Units	Unit	Cost/Unit	Cost/Operation
Custom Equipment	0.50	hours	\$ 45.00	\$ 22.50
Tree Removal Labor	0.50	hours	10.00	5.00
Tree Planting Labor	0.50	hours	10.00	5.00
Tractor & Equipment	1.00	hours	10.00	10.00
Cost of New Tree(s)	1.00	tree	7.00	7.00
Cost of Fumigant, etc.	0.00	tree	1.50	0.00
Miscellaneous	0.00		0.00	<u>0.00</u>
TOTAL				\$ 49.50

Table 2 below shows the process for calculating the lost income from the destroyed tree. Since we've assumed the new tree will reach full production in 12 years, the table only needs to address a 12-year time period. Observing the column headings, Column A is the anticipated loss in yield from the destroyed sweet cherry tree (100 pounds per year); Column B is the estimated long-term price of sweet cherries (\$.90 per pound); Column C is the projected gross income lost from the tree being destroyed (Column A x Column B); Column D includes production, harvest, and other costs associated with maintaining the current level of quality, grade, and yield of the lost sweet cherry crop (\$.25 per pound); Column E is the total production costs of maintaining a crop (Column A x Column D); and Column F is the total loss in income from the destroyed sweet cherry tree (Column C – Column E) for a total of \$780.00.

			(A x B)		(A x D)	(C - E)
	Yield		Est. of	Harvest	Cost to	Loss in
	Lb	Price	Dollars	Costs	Harvest	Income
Year	(A)	(B)	(C)	(D)	(E)	(F)
1	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
2	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
3	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
4	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
5	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
6	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
7	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
8	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
9	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
10	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
11	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
12	100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
						\$ 780.00

Table 2, Columns G through L, continues below to show the calculation of revenues and expenditures from planting a new tree. Column G is the anticipated yield of the new sweet cherry tree that is replacing the destroyed tree. Column H is again the estimated long-term price of sweet cherries (\$.90 per pound). Column I is the projected gross income gained from the new tree being planted (Column G x Column H). Column J includes production, harvest and other costs associated with maintaining a future level of quality, grade, and yields of the new crop. Column K is the total production costs of maintaining the new crop (Column G x Column J). Column L is the total gain in income from the new tree (Column I – Column K) for a total of \$305.50.

		(G x H)		(G x J)	(I - K)
Yield		Est. of	Harvest	Cost to	Gain in
Lb	Price	Dollars	Costs	Harvest	Income
(G)	(H)	(I)	(J)	(K)	(L)
0.00	\$ 0.90	\$ -	\$ 0.25	\$ -	\$ -
0.00	\$ 0.90	\$ -	\$ 0.25	\$ -	\$ -
0.00	\$ 0.90	\$ -	\$ 0.25	\$ -	\$ -
0.00	\$ 0.90	\$ -	\$ 0.25	\$ -	\$ -
10.00	\$ 0.90	\$ 9.00	\$ 0.25	\$ 2.50	\$ 6.50
20.00	\$ 0.90	\$ 18.00	\$ 0.25	\$ 5.00	\$ 13.00
40.00	\$ 0.90	\$ 36.00	\$ 0.25	\$ 10.00	\$ 26.00
60.00	\$ 0.90	\$ 54.00	\$ 0.25	\$ 15.00	\$ 39.00
70.00	\$ 0.90	\$ 63.00	\$ 0.25	\$ 17.50	\$ 45.50
80.00	\$ 0.90	\$ 72.00	\$ 0.25	\$ 20.00	\$ 52.00
90.00	\$ 0.90	\$ 81.00	\$ 0.25	\$ 22.50	\$ 58.50
100.00	\$ 0.90	\$ 90.00	\$ 0.25	\$ 25.00	\$ 65.00
					\$ 305.50

Table 2, Columns M through O, below summarizes the loss in income and the Net Present Value (NPV) of losing the sweet cherry tree and replacing it with a new tree. This table is important to the outcome of this analysis, so let's examine the information more closely. Column M is the total net income (\$474.50) from replacing the destroyed sweet cherry tree (the difference between Column F and Column L), before discounting. Column N is a set of discount factors that could reflect the interest rate of an interest-bearing account at a local bank, compounded annually, plus any other adjustments for risk, time, etc. In our case, we used a 6 percent discount rate. This calculation expresses 12 years of future income in today's dollars. Another way to explain this is that a dollar today is worth a dollar, but a dollar next year is worth \$0.943, a dollar in two years is worth \$0.89, and so on based on a 6 percent discount rate. Column O is the NPV of future income streams from losing the sweet cherry tree, a total of \$392.28.

Table 2. Estimating Income Losses From a Dead or Damaged Fruit Tree(s).		
(F - L)	6.00%	(M x N)
Net	Discount	NPV of
Income	Rate	Net Inc.
(M)	(N)	(O)
\$ 65.00	1.000	\$ 65.00
\$ 65.00	0.943	\$ 61.32
\$ 65.00	0.890	\$ 57.85
\$ 65.00	0.840	\$ 54.58
\$ 58.50	0.792	\$ 46.34
\$ 52.00	0.747	\$ 38.86
\$ 39.00	0.705	\$ 27.49
\$ 26.00	0.665	\$ 17.29
\$ 19.50	0.627	\$ 12.23
\$ 13.00	0.592	\$ 7.69
\$ 6.50	0.558	\$ 3.63
\$ -	0.527	\$ -
\$ 474.50		\$ 392.28

Table 3 below shows that the total payment the grower should receive is \$441.78 to be fully compensated for the loss in income from this particular sweet cherry tree. This figure is the amount of money the grower should receive as a payment today for the 12 years of lost income. Furthermore, if the grower would invest the \$441.78 in a savings account earning 6% interest, compounded annually, and withdraw the amount of money lost each year shown in Table 2, Column M, he would be compensated for the loss in income from the destroyed sweet cherry tree. As you can see by this example, the process for calculating the value of a destroyed or damaged fruit tree is complicated. However, it's important to follow a similar format for an equitable settlement for both parties.

Table 3. Present Value of Income Loss per Tree(s).			
Total Amount from Table 1. =			\$ 49.50
Total Amount from Column O, Table 2. =			\$ 392.28
LOSS PER TREE =			\$ 441.78

In conclusion, five important factors are needed to calculate the lost income from losing a destroyed or damaged fruit tree. They are: 1) the loss of future yields; 2) the yield estimates of the new tree until the yield, fruit size, and quality reaches that of the destroyed or damaged tree; 3) future fruit prices; 4) future harvesting costs; and 5) an appropriate discount rate. These factors should be negotiated between the parties before calculating the loss in net income.

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