10-15-1981

The Potential Dollar Value of Tree Loss in Orchards

George W. J. Laidlaw
Pesticides Division, Food Production and Inspection Branch, Agriculture Canada, Ottawa, Ontario

THE POTENTIAL DOLLAR VALUE OF TREE LOSS IN ORCHARDS

GEORGE W. J. LAIDLAW, Vertebrate Control Evaluation Officer, Pesticides Division, Food Production and Inspection Branch, Agriculture Canada, Ottawa, Ontario K1A 0C6

Rising costs have increased the need to re-evaluate the attributes which influence profit or lack of it. People are no longer willing to accept loss when cost-benefit information allows the farmer or orchardman to appreciate the repercussions associated with mismanagement.

Damage or loss due to rodents, rabbits and deer has not been well documented. Damage can be extensive, but for the most part the economic effect where tree loss occurs has not been explored.

This paper provides an estimate of actual loss over time due to tree damage or loss caused by the above vertebrate pests.

Current estimates (1980) indicate that the cost of producing a bushel of apples is approximately $4.00. Taken into consideration are the costs of labour to pick and prune, the use of machinery, pesticides, orchard management, land cost amortization, etc. Loss of producing trees due to girdling or excessive browsing, i.e., tree replacement and returning the replacement to production equivalent, can constitute a large monetary loss.

Take the example of a MacIntosh apple orchard where we assume the following:

-- 75 trees per acre.
-- At 10 years of age, each tree produces 8 bushels of apples.
-- At 15 years of age, each tree produces 15 bushels.

A single occurrence of a 5% tree loss (no subsequent loss) represents 75 X 0.05 or 3.75 trees per acre. A retail bushel of apples costs $8.00. Therefore, the loss per acre (based on retail cost of apples) is 3.75 trees X 8 bushels X $8 = $240 per acre. Since the cost of production (above) is estimated over a total yield, a 5% loss in yield would increase the production cost because of lower production. The production cost increase is 75 trees/acre X 8 bushels X $4 per bushel X 0.05 = $120 per acre.

A. Assume no increase in yield for trees 10 years to 15 years old. For the 5-year period, the one-time loss of 3.75 trees/acre costs ($240/acre + $120/acre) X 5 years = $1800/acre.

B. Assume trees from 15 to 20 years old produce 15 bushels per tree. The one-time 5% loss of trees represents 3.75 trees/acre X 15 bushels/tree X $8 = $450/acre. Production costs are still about $4 per bushel; 75 trees/acre X 15 bushels/tree X $4 = $4500; cost of production increases to $4725/acre due to the 5% loss and lower production (75 trees/acre X 15 bushels/tree X $4 X 0.05 = $225/acre). The total loss during this period is then 5 years X ($450/acre + $225/acre) = $3375/acre.

Assume the orchard has been returned to its original density of trees, i.e., killed trees have been replaced and are now at the 10-year-old production level, and the rest of the trees are at 20 years of age and at

maximal production. The cost of the 5% one-time tree loss is A + B (above), or $1800/acre + $3375/acre = $5175/acre. For a 15-acre orchard with a total loss of 3.75 trees/acre X 15 acres = 56.25 trees, this would result in a loss of $77,625 when compared to the normal full yield in the absence of damage.

In reality, a 5% loss is not large, nor is loss restricted to a one-time basis. Damaged trees may not fully recover and produce maximal yield, while young trees which are more susceptible to browsing and girdling pressure may be lost and have to be replaced more than once. Therefore, the loss of $5175/acre is a low estimate and a loss estimate based on subsequent yearly loss would be more realistic.

C. If a 5% tree loss occurs annually and half of the replacement trees are lost (after the initial loss), the yearly loss in yield and increased production cost are given below:

	Yield loss/acre	Production expense increase/acre due to yield loss
1st year	$ 240.	$ 120.
2nd year	356.	178.
3rd year	466.56	233.28
4th year	574.88	287.44
5th year	680.	340.
TOTAL	$2317.44	$1158.72

The total loss is $3476/acre ($2317 + $1159) over the five-year period, not $1800/acre as estimated for a one-time loss in "A" (above). The loss during each of the next five years if no further damage occurs is 10.63 trees X 15 bushels/tree X $8 = $1275.60/acre. Over the five years, this represents a loss of $1275.60 X 5 years = $6378/acre.

For a 75-tree orchard, a loss of 10.63 trees as stated above represents a 14.2% yield loss plus a related increase in production cost. The increased production cost due to the 14.2% yield loss during this five-year period is $639/year X 5 years = $3195/acre.

Thus, cost of damage for the first five years is $3476/acre ($2317 + $1159). Cost of damage for the next five years is $9573/acre ($6378 + $3195). The total cost of damage is $13,049/acre. This loss represents a substantially greater cost than originally estimated ($3375) as a one-time loss in "B" (above).

In a 15-acre orchard, a one-time 5% loss of trees represents $77,625, while a 5% annual loss during years 10-15 and no subsequent increase in damage over the next 5 years (as described in "C") represents $195,735 ($13,049/acre X 15 acres).

Few people can afford the luxury of allowing damage or tree loss when methods of control can reduce and prevent tree loss accordingly. These estimates point out the value that a healthy, producing tree has for the orchardman.