COST ANALYSIS
for the
COMMERCIAL PRODUCTION
of
CHRISTMAS TREES

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Cost Analysis for the Commercial
Production of Christmas Trees
by
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A Thesis
Presented to the Faculty
of the
School of Forestry
Oregon State College

In Partial Fulfillment
of the Requirements for the Degree
Bachelor of Science
June 1947

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Professor of Forestry
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INTRODUCTION

During the time this student has been in attendance at the School of Forestry at Oregon State College he has heard many students discussing the possibility of raising Christmas trees on a commercial basis; that is, farming them. Such discussion never developed beyond the "idle-thought" stage. It was realized that several different cost factors would enter into the raising of Christmas trees which might or might not make the enterprise profitable to the man undertaking it, but other than mentioning these costs, no effort was made to analyze the problem and to arrive at any decisive conclusion. Thus, in this paper an attempt will be made to determine the various costs, arrive at the total, compare this total to possible sales prices obtainable which should indicate whether the business of raising Christmas trees is or is not profitable.

In addition to the cost factors encountered in raising Christmas trees, the questions of the species to be raised, site to be chosen, proper stocking, rotation period, and marketing practices should be considered since these factors have a direct effect on the costs.

A similar study was made by Gervais in June 1945 in his thesis, "Production and Marketing of Douglas-fir Christmas
Trees on Western Oregon Farms." In this study the costs of raising the trees on unused portions of the farm area were developed and compared to the prices obtainable either on the retail market or the wholesale market. Suggestions also were made as to how, when, and where to plant, care of the plantations, and the marketing procedure for the trees. This paper, however, did not consider the production of trees as a separate enterprise but as an extra activity carried on in conjunction with farming on areas of the farm not suited to the production of the usual farm crops.
BASIC CONSIDERATIONS

Species to be raised

Douglas-fir is chosen as the species to be raised since it has very desirable characteristics and growth habits for growing trees on a commercial basis. It is also well suited for use as a Christmas tree since the branches are well spaced on the stem, the needles do not fall from the branches for several weeks after the tree has been cut nor do they brown readily, the tree itself is pleasantly aromatic, and, last, but not least, the tree has already gained a reputation as a Christmas tree which results in a high demand for it on the market.

Best suited land or site

Site III land is chosen as the best site upon which to grow the trees. The reason for this choice of a lower grade site lies in the fact that Douglas-fir on a superior site will make rapid growth, resulting in long internodes. Thus, the branches will be too far apart to make a desirable looking Christmas tree. Growth, however, is still rapid enough to make satisfactory increment on Site III.

It is also pointed out that while land of higher site class than Site III land may be more desirable for use in
raising a higher paying crop than is represented by trees. Site III land, especially a hill-side, is best suited to the raising of trees.

**Method of stocking**

Stocking should be such that the trees are not unnecessarily crowded because crowding will result in the distortion of the trees, making these trees less desirable on the market. The ideal situation is parallel rows with the trees evenly spaced along these rows. At maturity the individual stems should not be closer than eight feet apart. Thus, the rows will have to be at that interval. However, it is planned to make an intermediate harvest wherein smaller trees will be removed, leaving the desired interval for the trees that are to be left to maturity. Under this plan the stems will be four feet apart in rows four feet apart which will require 2,722 trees per acre.

**Choice of seedlings**

Seedlings to be used in planting should preferably be of two year old stock, root-pruned. Two year old stock is most desirable from a standpoint of survival and ease of handling in the planting operation.
Rotation period

Under favorable conditions Douglas-fir seedlings make a height growth of from ten to fifteen feet in ten years on an average site. This is about the maximum height that is to be desired for Christmas trees. Thus, maturity, or the time at which the crop will be completely harvested, may be set at ten years.

There will be an intermediate cutting for the purpose of thinning the stand and wherein the majority of the trees will be removed. The trees at this time will have attained a height of from four to six feet. This will occur in about six or seven years. However, this does not influence the rotation period since the rotation period is determined by the total removal of all trees.

The original planting plan contemplates the planting of 16 acres per year for ten years. Under the rotation plan 16 acres per year will be harvested. Immediately after harvesting, the area will be restocked, providing thereby for the continued operation of the enterprise.

The total acreage under production will be 160 acres.
ANALYSIS OF COSTS

Stocking the area

Seedlings may be obtained from the Oregon Forest Nursery at a cost of five dollars per thousand. At 2,700 trees per acre and 16 acres to be planted, the annual costs of seedlings will be:

\[ 5.00 \times 2.7 \times 16 \text{ equals } 216.00 \]

Value of investment in seedlings

The value of the investment in seedlings is computed as follows:

\[ \frac{1}{4} \text{ initial cost capitalized for ten years} \]
\[ \frac{3}{4} \text{ initial cost capitalized for six years} \]

These values are

\[ \frac{216}{4} \times (1.05)^{10} \text{ equals } 87.97 \]
\[ \frac{216}{4} \times (1.05)^{6} \times 3 \text{ equals } 217.08 \]

Total \[ 305.05 \]

Labor

Labor can be classified into four general headings. These are clearing, planting, maintenance, and harvesting.
Clearing-----

This may be accomplished at the rate of one man hour per acre. The area need not be cleared thoroughly but only such brush, ferns, logs, and debris as would hinder the proper growth of the seedlings need be removed.

Establishing an average rate of $1.00 per hour for labor, we have

\[
16 \text{ acres} \times 1 \text{ hr.} \times $1 = $16
\]

per year for clearing

Planting-----

The average workman should plant 300 trees per day. Thus, nine days will be required per acre of trees or a total of 16 x 9 or 144 man days per year. At the wage of $1.00 per hour, the cost of planting will be

\[
144 \times 8 \times $1 = $1,152
\]

Maintenance-----

It is estimated that 30 days per year will be the maximum time spent in the maintenance of the plantation after establishment. At the same wage scale, this cost will be

\[
30 \times 8 \times $1 = $240
\]
This estimation applies to 16 acres only because we are attempting to arrive at the costs for one crop.

**Harvesting----**

It is estimated that one man can harvest and bundle 300 trees in an eight-hour period. Thus, nine days will be required per acre of trees or 144 man days per crop. The cost of harvesting and bundling for shipment will be

\[
144 \times 8 \times \$1 \text{ equals } \$1,152
\]

**Value of investment in labor**

The cost of clearing and planting must be accumulated at interest as follows:

\[
(\$16 \text{ plus } \$1152) \times (1.05)^{10} \text{ equals } \$1902.56
\]

Maintenance must be treated in the following manner:

\[
\$240 \times (1.05^{10} - 1) \text{ equals } \$3018.70
\]

**Land**

The land will cost from \$1.00 to \$10.00 per acre depending upon what deal can be made with the present owner. Some cutover lands are readily available at \$1.00 per acre, but as the land becomes more desirable for other purposes the price per acre will increase. Accessibility also enters
into the picture. For the purpose of this paper, we shall use the average price of $5.00 per acre. Thus, the initial investment in land will be

160 acres x $5 per acre equals $800

In order to allocate costs to a specific rotation, we must divide this figure by the number of rotation units. Thus

$800 \div 10 = $80 chargeable to one rotation unit

Value of investment in land

The initial investment in land must be capitalized throughout the rotation period in order to determine the total charge against the crop for the use of the land. The initial cost of the land is to be charged off against the first rotation. Subsequent rotations will not have to bear this charge but only that amount as the money, if invested in some other enterprise, would earn. This is done as follows:

$80 \times (1.05)^{10} = $130.32

Cost of taxes

Taxes in the Willamette Valley area will be from 20 to 30 mils depending upon the characteristics of the land. This is applied to one-half the assessed value. Again we
shall use an average figure of 30 mils. Thus, for one rotation unit we have

\[ \$40 \times 0.003 = \$1.20 \text{ per year} \]

**Value of investment in taxes**

This consists of ten payments accumulated at interest throughout the rotation period.

\[ \$1.20 \times (1.05^{10} - 1) = \$15.10 \]

**Protection**

Protection against fire is obtainable from the State of Oregon at the rate of 6 cents per acre per year. Thus, the cost of protection for a rotation unit will be

16 acres \( \times \$0.06 \) per acre equals \$0.96 per year

**Value of investment in protection**

This consists of ten payments accumulated at interest throughout the rotation period.

\[ \$0.96 \times (1.05^{10} - 1) = \$12.08 \]

**Comment on taxes and protection**

In the preceding paragraphs the total costs have been computed on the basis of ten years; i.e., the rotation period. However, it can readily be seen that for the second
unit the first crop will have to bear the charges for eleven years, the third unit will have to bear the charges for twelve years and so on up to the tenth unit which will have to bear the charges for twenty years. After the realization of the first crop from each unit, this will no longer hold true. Following crops will then have to bear the charge for the length of the rotation period only.

The individual charges against each unit for the first crop were not computed in this paper because (1) the amount will not be so great as to materially affect the feasibility of the operation and (2) the purpose is to determine the costs which will enter into the production throughout a rotation period based on a crop every ten years.

Transportation to market

Trees grown in this area, if shipped to San Francisco, will have to be shipped for approximately 650 miles. Using Gervais' estimation of $.20 per mile per 2,000 trees, we arrive at

$$\frac{1838 \times 16 \times .20 \times 650}{2000} = $1911.52$$
## SUMMARY OF COSTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>130.32</td>
</tr>
<tr>
<td>Taxes</td>
<td>15.10</td>
</tr>
<tr>
<td>Protection</td>
<td>12.08</td>
</tr>
<tr>
<td>Seedlings</td>
<td>305.05</td>
</tr>
<tr>
<td>Clearing and Planting</td>
<td>1902.56</td>
</tr>
<tr>
<td>Maintenance of plantation</td>
<td>3018.70</td>
</tr>
<tr>
<td>Harvesting</td>
<td>1152.00</td>
</tr>
<tr>
<td>Transportation to market</td>
<td>1911.52</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8447.33</strong></td>
</tr>
</tbody>
</table>
INCOME FROM SALE OF TREES

Marketing the trees

The trees may either be sold at retail prices or to wholesale dealers. If sold at retail, much higher returns are realized from the enterprise. Prices in San Francisco during recent years have been as follows:

- Douglas-fir-------- $0.50 a foot
- Red Fir----------- $0.75 a foot
- Silver Tip-------- $1.00 a foot

Wholesale prices as quoted by the Portland Chamber of Commerce for Douglas-fir only were from 20 cents to 40 cents a tree. Assuming that the average tree will bring the average price of 30 cents and that the average tree will be six feet tall we arrive at a wholesale price of 5 cents a foot in Portland. However, due to a greater demand for trees in proportion to supply in San Francisco, it would be wise to dispose of them there since higher returns are probable. No prices were obtainable from the Chamber of Commerce in San Francisco with regard to wholesale prices, but, using an equal ratio as indicated by Portland statistics; that is, wholesale price of 5 cents compared to retail price of 15 cents, we arrive at the probable price in San Francisco of 16 2/3 cents a foot.
Income computed as follows:

Survival of trees in the plantation will not be 100%. An allowance of 10% will be made for death losses. In addition, all harvested trees will not be marketable. Assuming that there will be as much as 25% cull, we have the total number of marketable trees as 1838.

At the end of six years three-fourths of the trees will be harvested. These trees will average five feet in height. Income from them is

$$1378 \times 16 \times \$.16667 \times 5 = \$18,373.70$$

At the end of ten years, the remaining trees will be harvested. These trees will average ten feet in height. Income from them is

$$460 \times 16 \times \$.16667 \times 10 = \$12,266.91$$

The income realized at six years should be accumulated at interest for the remaining four years of the rotation as follows:

$$\$18,373.70 \times (1.05)^4 = \$22,342.42$$

Total income from one rotation is

$$\$22,342.42$$
$$\$12,266.91$$
$$\$34,609.33$$
COMPARISON OF COSTS TO INCOME

 Determination of balance

 The difference between the costs of growing the trees and the income derived from the sale of them is seen to be positive as indicated below.

 Wholesale returns----- $34,609.33
 Cost of production---- 8,447.33
 Balance $26,162.00

 Conclusions

 1. An operation for the commercial production of Christmas trees based on a rotation period of ten years embracing an area of 160 acres is feasible.

 2. While the costs and figures in this paper do not represent stable conditions; i.e., sales prices and labor costs are subject to fluctuation, it does represent a favorable balance between the costs and the returns.