

TREE IMPROVEMENT AND THE CHRISTMAS TREE GROWERS

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Abstract: The next major improvement in the growing of quality christmas trees could come from propagation of superior trees. Interest is focused on selections of individual trees within known seed sources of Douglas firs and the true firs; Balsam, Fraser and Concolor. Discussion of propagation is limited to cuttings, grafts, plugs and seed orchards. The economics of christmas tree growing is discussed at length. A hypothesis is proposed with genetic improved stock. The economic gains that could result would be funded in part with the needed research.

The christmas tree growers throughout the Northern American Continent have varied choices of genetic material from which to choose. Most seed sources that are used are native, except for a few exotics such as Scotch Pine, Nordman fir and Afghan Pine. Some growers are limited to pines because of hot summer days such as Virginia Pine, grown in Georgia. For those subject to spring frosts, the late flushing spruces and firs are possibilities. It is quite possible that some kind of evergreen can be grown for christmas trees in every state of the United States.

The size of our industry, as estimated by the National Christmas Tree Growers Association, contains 12,000 growers with 700 million trees planted on one million acres. The annual harvest is thirty-two million trees with a cash flow of 600-700 million dollars between growers and retailers. Compared to other industries, it may not sound like much in dollars but, it is a healthy one that employes many people. A comparison might help to prove that point.

Gross Dollar Returns per Acre per Year

field corn

100 bushels * \$3.00 per bushel = \$300.00

Pennsylvania hardwood chips

100-140 tons * \$18.00 per ton = \$2500.00/40 yrs. = \$62.50

christmas trees on stump price

1000 trees * \$10.00 = \$10,000.00/10 yrs. = \$1000.00

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100 ACRE CHRISTMAS TREE FARM GROWING DOUGLAS FIR
ON A 10 YEAR ROTATION

Grade	#1	#2	#3	Cull
Avg. \$ Value	15.00	8.00	4.00	0

Percent of Crop by Grade

Present Growing Stock	50	30	10	10
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Weighted Average per crop tree = \$10.30

CCST OF GROWING TREES ON A 10 YEAR ROTATION
WITH 20 PERCENT CULL TRANSPLANT REPLACEMENT

1 Acre x 1200 trees x \$4.00 * = \$4800

20 % culls = 240 trees @ \$10.00 = \$2400

\$7200

1080 Good trees per acre cost \$6.67 per tree
(10 % trees are culls at end of rotation)

* 10 year rotation x \$400 growing cost/acre/year = \$4000
Establishment cost for 1200 trees/acre = 800

Total/acre \$4800

1200 trees/ \$4800 total cost = \$4.00 per tree

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<u>Improved Growing Stock</u>	80	15	5	0
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Weighted Average per crop tree = \$13.40

POTENTIAL DOLLAR GAIN PER YEAR USING IMPROVED STOCK
ON A 10 YEAR ROTATION ON A 100 ACRE CHRISTMAS TREE FARM

Elimination of replanting @ \$160 / acre	\$1,600
Management cost saving @ \$100 / acre *	10,000
Quality gain on harvest of 12,000 trees	<u>37,200</u>
Total gain per year over a 10 year rotation	\$48,000

* Increased management efficiency in control and operations (\$400/acre normal - \$300/acre for improved stock = \$100/acre saving)

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<u>Improved Growing Stock Resulting</u>				
<u>in an 8 year rotation</u>	80	15	5	0
(12.5 acres / rotation vs. 10 acres)				

Weighted Average per crop tree = \$13.40

POTENTIAL DOLLAR GAIN PER YEAR USING IMPROVED STOCK
ON AN 8 YEAR ROTATION ON A 100 ACRE CHRISTMAS TREE FARM

Elimination of replanting @ \$160 / acre	\$ 2,000
Management cost savings @ \$100 / acre (12.5 acre x 8 years x \$100 / acre)	10,000
Quality gain on harvest of 15,000 trees	<u>46,500</u>
Total gain per year over an 8 year rotation	\$58,500

INCREASED PRODUCTION BY GOING TO 8 YEAR ROTATION = \$9,700 / YEAR

(\$48,000 / year for 10 years - \$58,500 / year for 8 years)

The 100 acre farm over 8 years would have a \$77,600 gain over the 10 year rotation and would have gone through a complete rotation on all 100 acres.

POTENTIAL DOLLARS AVAILABLE FOR DEVELOPING IMPROVED PLANTING STOCK
BASED ON IMPROVED SURVIVAL TO MARKET AND IMPROVED QUALITY

10 year rotation planting 1200 average stock / acre and harvesting 1080 trees (1080 trees x \$10.30 / tree)	\$11,124
10 year rotation planting 1200 improved stock / acre and harvesting 1200 trees (1200 trees x \$13.40 / tree)	\$16,080
Total potential gain per acre	\$ 4,956
	\$4,956 / 1200 trees = \$4.13 / tree
	Normal stock costs - \$0.50 / tree

Potential dollars available to produce improved stock = \$3.63 / tree
(breeding, rooting, grafting, tissue culture, etc.)

A Christmas tree grower using these gains could justify paying \$3,000 or more per 1000 for trees that would give him these results in improved survival, reduced management cost, and increased quality.

Rooted cuttings: Oregon State University Department of Horticulture under the leadership of Doctor A. N. Roberts became interested in establishing superior clones of christmas trees in 1969. Financial support came from the Northwest Area Foundation and Crown Zellerback Corporation; also, Oregon Agriculture Experimental Station, The School of Forestry and the Northwest Christmas Tree Growers Association. Douglas fir of the green or coastal seed source was part of the rooted cutting research. In 1978, I was priveleged to observe what was accomplished up to that time. There were some very serious problems with rooted cuttings developing dominate leaders. As I recall about one in 100 had the necessary straight leader. Instead of giving up at that point, it was decided to screen a large number of trees to find ones that would root well and maintain good leaders. By 1985, I again observed this program and the goal had been accomplished. There is now enough propagated stock to distribute to the propagators. The next step will be to get large quantities of planting stock out to the growers. It appears that rooted cuttings of coastal Douglas fir need one to four years before they develop strong leaders.

Table I - Dip'n Grow

1.0% idolebutyic acid (IBA)
 0.5% naphthalene acedic acid (NAP)
 0.0175% boron
 0.1% phygon
 20.0% methyl sulfoxide (DMSO)

cuttings dipped for 5 sec. in 10% Dip'n Grow
 95% ethanol solution

Table II - Rooting Percentage, Cultural Ratings and Rank of Ten Douglas-Fir Clones

	Rooting% 1974	1982	Form	Bushi- ness	Needle Attractive- ness	Vigor	Overall
Douglass 1	27	84	10	9	10	8	9.5
Douglass 2	18	100	9.5	9	9	8.5	9
Douglass 3	92	82	9	10	7	7	8.5
Douglass 4	55	90	9	10	7	6	8
Douglass 5	28	94	8	8	7.5	8	8
Mitchell	63	62	7	6.5	9	10	7.5
Newton	28	77	8	8	7	8	8
Douglass 6	17	30	8.5	8.5	7	7	8
Douglass 7	73	82	7	7	7	8	7
Douglass 8		94	7	7	8	6	7
Hanning 1	70	100	6	5.5	8	8	6.5

* Table II demonstrates that cuttings taken from cuttings improves rootability

Plugs: We are using plugs to take advantage of the size one can achieve in the greenhouse in one year compared to three years in the seed bed. We can get more little trees (plugs) out of a pound of seed by "germ sowing". One test that we did with three pounds of Fraser fir "germ sowed" gave us better than 20,000 plugs per pound. That same seed lot sown year after year in outside beds would yield 8,000 3-0 seedlings per pound. Plugs put into a transplant bed on the west coast grow as large as 2-2 field grown transplants on my farm. A plug +1 is a two year old which is a two year savings compared to field grown stock.

Grafts: There is only one grower that I know of that makes grafts of Noble fir for growing into christmas trees. Charlie Burton of Cinebar Washington has been doing it for many years. He has been able to get the job done with local help. The procedure is to use a large plug slightly root-bound so that it stays in its cavity shape when pulled for grafting. The type of graft that he uses is a cleft graph. The understock is split and a scion is inserted, then wrapped with a rubber band. No wax is used. Success rates of 98% can be achieved. It is immportant to match the size of the scion wood with the understock. A careful matching of the cambian layer on both sides of the graft assures a higher percentage of success.

Seed Orchards: Tree growers are always looking for their best trees to cut and sell. If only we could get the best saved for the future by transplanting them into seed orchards. It will take some promotion by you, the tree geneticsists, to encourage tree growers to do so. There are very few growers that are making seed orchards today. Thus, we are missing an opportunity because tree growers have blocks of genetic material that can be easily surveyed for potential use in tree improvement.

Hybrids:

Fraser - Balsam Crosses

*Canaan Balsam natural cross
Cheat Mountain West Virginia
Davis - Harmon area

* Fraser fir * Cook Balsam Mc Cormack man made
Wolcott Vermont
John Young farm

The so called hybrids have the most beautiful foliage for a christmas tree I have ever observed. The Canaan balsam is being researched at Wooster Ohio by Jim Brown.

Conclusion: The cost of producing christmas trees under intensive management has increased costs dramatically with use of herbicides, fertilizer and insecticides. It is no longer a numbers game where you plant 50,000 trees and hope to harvest 25,000 because of lack of quality. The potential (lost income) of 20% of the crop will make the remaining trees cost almost double at harvest time. Genetic improvement of christmas trees has a very bright future in terms of increased profits, quality and shortened rotation time.