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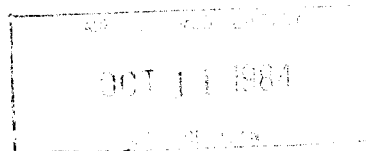


University of Tennessee Agricultural Experiment Station

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and
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ESTIMATING COSTS OF PRODUCING FIELD-GROWN NURSERY PLANTS*

by

M. B. Badenhop and Travis D. Phillips**

INTRODUCTION

The purpose of this report is to summarize a process for estimating the cost of producing field-grown nursery plants. The Southern Regional Research Technical Committee (S-103), composed of horticulturists and agricultural economists from the land-grant universities of the South, has developed cost of production budgets for several representative plants produced in the South.¹ These budgets in each case represent one or two specific production systems.

The budgets were developed to aid producers in estimating their production costs. The ideal would be for nurserymen to keep sufficient records to estimate their costs in the same details that were used by the researchers in developing the budgets. However, few are likely to do so.

The objective then is to discuss some alternatives. However, before doing that, the question of why it is necessary to know the cost of producing individual plants should be addressed. Some nurserymen might say that

*Presented to the Kentucky Nurserymen Association, Louisville, Kentucky, January 9, 1981.

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¹The project is S-103, Economics of Producing and Marketing Woody Ornamentals in the South. The research is a cooperative effort of the State Agricultural Experiment Stations in nine Southern states and the Tennessee Valley Authority. The nine cooperating states are: Alabama, Arkansas, Florida, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia.

they don't particularly care about knowing the costs of producing particular crops; they just want to know how to make the maximum profit.

There are at least two reasons for needing cost information for each crop in order to maximize profits. First, if cost is not known, how can prices be determined? Second, if all prices cannot be fully adjusted to cover all costs, what combination of crops should be produced to maximize profits? In other words, what is the profit from each crop and which crop should be dropped or its production reduced and which should be expanded? Detailed records of costs and activities are required for answering such questions.

Many nurserymen do not keep records beyond the Schedule F of Form 1040 required by the Internal Revenue Service for paying federal income taxes. However, if a nurseryman thinks the bottom line on which he pays taxes represents a true measure of his performance as a manager and the return on his investment, he should have another thought. Assuming the nursery is not incorporated, this taxable income represents the return to unpaid labor, management, and investment. How does this return compare with what the operator could earn elsewhere and what the capital could earn if invested elsewhere? Thus, even if there is no interest in estimating costs for individual plants, consideration should be given to further analysis of taxable income as described above.

The ultimate in cost estimated represents a situation where so much detail has been kept that when the cost of producing each crop is added up, the total for all crops is equal to the numbers appearing on the Schedule F. Such a situation requires that records be kept daily assigning all labor, equipment usage, and materials to the appropriate crops or general overhead activities such as repairs and general maintenance.

The concept of assigning labor, equipment, and materials by crops is a good idea because it makes both management and labor personnel more conscious of how the day was used. Not much time is required to record data. The real work in the process has to do with all the summary work in the office.

Regardless of the above details, many cost items fall into the category of general overhead and must be allocated to crops. However, once a realistic procedure has been developed, the process becomes a repetitive one. Few nurseries now keep such records. This may change with the availability of the minicomputer to reduce the hard paper work. However, the computer only speeds up calculations; it will not eliminate the records which must be fed into it.

A third alternative represents modifying the budgets developed by the agricultural experiment station researchers. The big problem is that a particular nursery may not resemble closely the one described by the budgets. If not properly used, the procedure might lead to faulty cost estimates.

The fourth alternative is a hybrid of the others. Budgets are used to estimate some performance rates and costs while an allocation scheme is devised to distribute the actual overhead cost items to crops.

It is this latter approach that is illustrated here. Major emphasis will be on illustrating a single-year harvest system in which bare root and two sizes of balled and burlapped (B&B) trees are harvested. Then, the necessary modifications will be made for a more realistic staggered period harvest.

PRODUCTION COST ESTIMATES

For purposes of illustration, data for a hypothetical 50-acre nursery were developed primarily from data reported in Southern Cooperative Series Bulletin 224, Cost of Producing and Marketing a Shade Tree: The Pin Oak, published January, 1980 [1].

Suppose Schedule F, which is the usual income statement for tax purposes, is all the nurserymen had initially as summary records. Then, from this data and with the help of the budget in the pin oak bulletin, the costs of producing an acre block of pin oaks and the average cost per tree can be estimated.

Description of the Nursery

Before getting down to cost estimating, the nursery must be fully described including land usage, buildings, equipment, and labor. The hypothetical 50-acre nursery consists of 30 acres of active growing area at one time with 5 acres used for buildings and roads and the remaining 15 acres involved in conservation practices between crops. The common denominator, of course, is the 30 acres of production because all the overhead costs associated with the other 20 must be covered.

Administration and labor consists of a full-time owner-manager, another full-time supervisor, a full-time bookkeeper-secretary, and unskilled laborers. B&B plants are custom dug. The manager devotes 20% of his time directly to plant production with the remaining 80% in management activities. Since the nursery is not incorporated, there is no charge in the Schedule F for the owner-manager's salary. The supervisor splits his time equally between production and management. Eighty percent of the unskilled labor

is directly associated with production with the other 20% involved with general maintenance, repairs, slack time between jobs, weather losses, and other activities which cannot be allocated to a particular crop.

The details of total investment are contained in Table 1. An initial investment of more than \$207,000 is involved with nearly one-half being land. Interest is a considerable cost if the investment is totally financed, or if one considers how much could be earned on this investment if such fund were invested elsewhere. Interest on capital needed for investment purposes was charged at an annual rate of 10% compounded over the time span required to grow the crop. Investment capital included the owner's own capital (his equity) and that which he might have borrowed.

The unit of production being considered is an acre of pin oaks started from transplanted seedlings. The survival rate is about 85% with another 5.5% of the trees which are marketed as bare root being lost in the grading process. Thus, 4,840 seedlings were transplanted and after 3 years they yield 400 B&B 8'-10', 800 B&B 6'-8', and 2,914 bare roots 5'-6'. Since 160 of the bare root trees will be lost to grading, a unit of production (1 acre) will produce 3,954 salable trees having three different price tags because of product variation. At the same time all the salable trees must be considered as having the same average costs.

Initially it is assumed that the only financial data available are those data contained on the Schedule F. The total costs reported will determine the amount of income taxes paid when they are subtracted from gross profits. A charge, however, must be added for the managerial services provided by the owner-manager, for interest on the investment, and for interest on operating capital.

Table 1. Estimated capital requirements for 50-acre field nursery

Item	Description	Total initial cost or value ---dollars---
Land	50 acres	100,000
Buildings:		
Office	25' x 60'	30,000
Machinery storage	12' x 100'	7,200
Supplies storage	30' x 60'	12,000
Machinery and equipment:		
Tractor	34 hp	6,562
Tractor with frond end loader	50 hp	10,900
Tractor	80 hp	13,000
Plow	3-14" mounted	1,242
Disk	8' tandem, mounted	814
Harrow	10'	340
Cultivator	2-row	829
Rotovator	50"	2,310
Sprayer	Boom	504
Sprayer	Air blast	3,000
Transplanter	2-row	1,050
Fertilizer	--	386
Pickup truck	1/2 ton	5,000
U-blade digger	--	210
Fork lift	--	2,000
Rotary mower	--	700
Farm trailer	4-wheel (2)	1,200
Truck	1 1/2 ton	<u>8,100</u>
Total		207,347

Source: [1].

Classification of Costs

Before much can be done with the gross figures on the Schedule F, a cost classification scheme must be described. Those costs must be identified which can be associated directly with the acre of pin oaks. These are called variable costs and consist of items such as labor used

SCHEDULE F (Form 1040)

Department of the Treasury Internal Revenue Service

Farm Income and Expenses

Attach to Form 1040, Form 1041, or Form 1065. See Instructions for Schedule F (Form 1040).

1979

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Name of proprietor(s)

Social security number

Farm name and address

Employer identification number (see instructions)

Part I Farm Income—Cash Method Do not include sales of livestock held for draft, breeding, sport, or dairy purposes; report these sales on Form 4797.

Table with 3 columns: a. Description, b. Amount, c. Cost or other basis. Rows include 1 Livestock, 2 Other items, 3 Totals, 4 Profit or (loss).

Sales of Livestock and Produce You Raised and Other Farm Income

Table with 2 columns: Kind, Amount. Rows include 5 Cattle, 6 Calves, 7 Sheep, 8 Swine, 9 Poultry, 10 Dairy products, 11 Eggs, 12 Wool, 13 Cotton, 14 Tobacco, 15 Vegetables, 16 Soybeans, 17 Corn, 18 Other grains, 19 Hay, 20 Straw, 21 Fruits and nuts, 22 Machine work, 23 Patronage dividends, 24 Per-unit retains, 25 Nonpatronage distributions, 26 Agricultural program payments, 27 Commodity credit loans, 28 Federal gasoline tax credit, 29 State gasoline tax refund, 30 Other (specify), 31 Add lines 5 through 30, 32 Gross profits*.

Part II Farm Deductions—Cash and Accrual Method

Do not include personal or living expenses (such as taxes, insurance, repairs, etc., on your home), which do not produce farm income. Reduce the amount of your farm deductions by any reimbursement before entering the deduction below.

Table with 2 columns: Items, Amount. Rows include 33 a Labor hired, b Jobs credit, c WIN credit, d Total credits, e Balance, 34 Repairs, maintenance, 35 Interest, 36 Rent of farm, pasture, 37 Feed purchased, 38 Seeds, plants purchased, 39 Fertilizers, lime, chemicals, 40 Machine hire, 41 Supplies purchased, 42 Breeding fees, 43 Veterinary fees, medicine, 44 Gasoline, fuel, oil, 45 Storage, warehousing, 46 Taxes, 47 Insurance, 48 Utilities, 49 Freight, trucking, 50 Conservation expenses, 51 Land clearing expenses, 52 Pension and profit-sharing plans, 53 Employee benefit programs, 54 Other (specify) Advertising, Licenses, bonds, dues, Travel expenses, Custom digging, 55 Add lines 33e through 54, 56 Depreciation, 57 Total deductions.

58 Net farm profit or (loss) (subtract line 57 from line 32). If a profit, enter on Form 1040, line 19, and on Schedule SE, Part I, line 1a. If a loss, go on to line 59. (Fiduciaries and partnerships, see the Instructions.)

59 If you have a loss, do you have amounts for which you are not "at risk" in this farm (see Instructions)? Yes No

*Use amount on line 32 for optional method of computing net earnings from self-employment. (See Schedule SE, Part I, line 3.)

directly on the crop, chemicals, and seedlings. The other broad group is the indirect costs which cannot be allocated directly to a particular crop. The major items in this group are 1) administrative labor costs; 2) fixed costs associated with the investment such as depreciation, interest, and taxes; and 3) other general overhead costs such as utilities, insurance on personnel, and advertising.

If only one crop were produced and harvested every 3 years, a charge can be added for the owner's salary and for interest on investment and on operating capital based on the growing time of the crop. These costs can then be divided by the 30 acres of active growing area to get a per acre cost or by the actual number of salable plants produced to get a per plant cost. However, since the other 20 acres of the nursery are likely used for conservation practices between crops and for buildings and roads, the indirect costs associated with these acres must be allocated also. The direct or variable costs associated with producing an acre of oaks must be estimated also.

Unfortunately, the costs contained on the Schedule F have been aggregated and must be allocated into the regime described above. Therefore, a scheme may be used such as described by Perkins and Levins [2].

Each item on the Schedule F must be dealt with to identify the indirect cost. The direct or variable costs will be estimated from data in the pin oak bulletin [1].

COST ESTIMATE FOR THREE-YEAR SINGLE HARVEST

The data presented in the first column of Table 2 represents Schedule F costs. The second column represents those costs which cannot be directly allocated to a crop plus the opportunity cost representing a payment to the owner-manager for the value of his management and labor and an interest charge on the owner's equity in operating and investment capital.

It was assumed that one-half of the supervisor's time and 80% of unskilled labor's time could be directly assigned to a crop. Many other items are also part direct costs and part indirect costs, but they were classified as either one or the other. Since the Schedule F costs did not include a salary for the owner-manager, it was estimated that he could earn \$20,000 elsewhere, and that 80% of his time would not be devoted directly to a particular crop. An interest rate of 10% was used to represent the opportunity cost or alternative rate of return which could be earned elsewhere on all money invested in the business.

Thus, costs of \$89,257 were estimated in the overhead category of indirect or fixed costs. This \$89,257 when spread over 30 acres of growing crops amounts to \$2,975 per acre per year of \$.75 per tree per year when 3,954 salable trees were produced. Of course, this cost increases by the amount of accumulated interest cost each year until the crop is sold.

Next, turn to the pin oak bulletin for help in estimating the variable or direct costs. Data contained in Table 3 provide the basis of estimating the variable cost per hour for machinery and equipment. Depreciation, taxes, insurance, and interest for machinery and equipment were included in the fixed costs above.

Table 2. Estimate of fixed or indirect costs for 50-acre nursery for 1 year

Cost item	Schedule F values	Fixed or indirect costs
	-----dollars-----	
Hired labor:		
Supervisor	16,350	8,175 ^a
Office	12,720	12,720 ^a
Unskilled	20,710	4,142 ^a
Custom digging	12,365	
Repairs and maintenance	3,200	3,200
Seeds and plants purchased	12,360	
Fertilizer, lime, chemicals	4,320	
Supplies purchased	5,260	5,260
Gasoline, fuel, oil	2,525	
Taxes	1,785	1,785
Insurance	2,170	2,170
Utilities	2,450	2,450
Advertising	1,250	1,250
Licenses, bonds, dues	540	540
Travel expense	1,625	1,625
Depreciation	<u>8,285</u>	<u>8,285</u>
Total	107,915	51,602
Opportunity costs:		
Owner-manager salary		16,000 ^a
Interest on above fixed costs		3,380 ^b
Interest on investment @ 10%		
Land		10,000 ^b
Buildings		2,460 ^b
Equipment		<u>5,815^b</u>
Total fixed costs		89,257

^aBased on 50% for supervisor, 100% of office, 20% of unskilled, and 80% of owner-manager.

^bBased on 100% of value for land and equipment and 50% of value for buildings and fixed costs from Schedule F and owner's salary.

Table 3. Data for estimating the variable cost per hour for machinery and equipment for a 50-acre nursery

Type of machine	New cost dollars	Expected life --years--	Estimated annual use --hours--	Repairs percent of new cost	Variable cost per hour ^a dollars
Tractor, 34 hp	6,562	10	700	60	1.70
Tractor, 50 hp with front end loader	10,900	10	600	60	2.32
Tractor, 80 hp	13,000	10	600	60	4.50
Plow, 3-14" mounted	1,242	10	100	60	.75
Disk, 8' tandem	814	10	40	40	.47
Harrow, 10'	340	10	30	30	.15
Cultivator, 2-row	829	10	60	60	.83
Rotovator, 50"	2,310	8	50	70	4.04
Sprayer, boom	504	8	40	60	.94
Sprayer, air blast	3,000	10	100	60	1.80
Transplanter, 2-row	1,050	10	40	60	1.01
Fertilizer, spreader	386	6	60	20	.29
Pickup truck, 1/2 ton	5,000	10	300	60	2.85
U-blade, digger	210	10	30	60	.50
Rotary mower, 5' mounted	700	10	60	80	.79
Farm trailer, 4-wheel	600	10	100	40	.36
Fork lift	2,000	10	40	60	.78
Truck, 1 1/2 ton	8,100	10	200	60	3.56

^aIncludes fuel, lubrication cost, and repairs.

Source: [1].

Data in Table 4 presents a year-by-year detailed explanation of variable costs. These details should be very helpful to a nurseryman in estimating his variable costs when he has not kept detailed records. He needs simply to modify the equipment, materials, performance rates, and costs of inputs to make his own estimates.

Table 4. Estimated variable cost of producing 1 acre of oaks from 1-year old seedlings to 3-year old salable plants

Item	Description	Unit	Quantity -number-	Price per unit -----dollars----	Total cost
<u>Year 1:</u>					
Plants	1-year seedlings	ea.	4,840.00	.40	1,936.00
Chemicals ^a	Fertilizer (10-10-10)	lb.	1,500.00	.06	90.00
	Simazine 80W	lb.	7.5	4.00	30.00
	Enide 50W	lb.	16.0	2.75	44.00
	Roundup	gal.	.15	60.00	9.00
	Sevin (may vary with insect)	lb.	6	1.70	10.20
Machinery and equip- ment ^b	Tractor, 34 hp	hr.	8.00	1.70	13.60
	Tractor, 50 hp with front end loader	hr.	8.00	2.32	18.56
	Tractor, 80 hp	hr.	6.00	4.50	27.00
	Plow	hr.	2.00	.75	1.50
	Disk (2x)	hr.	1.50	.47	.70
	Harrow	hr.	1.00	.15	.15
	Fertilizer spreader	hr.	3.00	.29	.87
	Boom sprayer	hr.	6.00	.94	5.64
	Transplanter	hr.	6.00	1.01	6.06
	Cultivator	hr.	4.50	.83	3.73
	Trailer, 4-wheel	hr.	2.00	.36	.72
Air blast sprayer	hr.	1.50	1.80	2.02	
Labor	Field production	hr.	70.00	4.00	280.00
	Related activities ^c	hr.	14.00	4.00	57.00
Subtotal					2,535.75
Interest on operating capital 6 months @ 10%					126.79
Total, year 1					2,662.54
<u>Year 2:</u>					
Chemicals	Fertilizer (10-10-10)	lb.	1,000.00	.06	60.00
	Simazine 80W	lb.	5.00	4.00	20.00
	Enide 50W	lb.	16.00	2.75	44.00
	Roundup	gal.	.15	60.00	9.00
	Sevin (may vary with insect)	lb.	6.00	1.70	10.20

Table 4 (continued)

Item	Description	Unit	Quantity -number-	Price per unit -----dollars-----	Total cost
Machinery and equip- ment	Tractor, 34 hp	hr.	4.50	1.70	7.65
	Tractor, 50 hp with front end loader	hr.	3.00	2.32	6.96
	Fertilizer spreader	hr.	2.00	.29	.58
	Boom sprayer	hr.	1.00	.94	.94
	Cultivator	hr.	3.00	.83	2.49
Labor	Field production ^c	hr.	57.00	4.00	228.00
	Related activities ^c	hr.	11.40	4.00	45.60
Subtotal					435.42
Interest, year 1 compounded @ 10% and on operating capital, year 2, 6 months @ 10%					288.02
Total, year 2					723.44
Year 3:					
Chemicals	Fertilizer (10-10-10)	lb.	1,000.00	.06	60.00
	Simazine 80W	lb.	5.00	4.00	20.00
	Enide 50W	lb.	16.00	2.75	44.00
	Roundup	gal.	.15	60.00	9.00
	Sevin (may vary with insect)	lb.	6.00	1.20	10.20
Harvest (85% survival) (custom)	6'-8' B&B	ea.	800.00	.85	680.00
	8'-10' B&B	ea.	400.00	1.00	400.00
	Burlap and twine	ea.	1,200.00	.30	360.00
Machinery and equip- ment	Tractor, 34 hp	hr.	10.30	1.70	17.51
	Tractor, 50 hp with front end loader	hr.	9.00	2.32	20.88
	Tractor, 80 hp	hr.	8.00	4.50	36.00
	Fertilizer spreader	hr.	2.00	.29	.58
	Boom sprayer	hr.	.80	.94	.75
	U-blade, bare root	hr.	8.00	.50	4.00
	Trailer, 4-wheel	hr.	6.00	.36	2.16
	Fork lift	hr.	6.00	.78	4.68
	Pallets	ea.	12.00	.30	3.60
Cultivator	hr.	3.00	.83	2.49	

Table 4 (continued)

Item	Description	Unit	Quantity -number-	Price per unit -----dollars-----	Total cost
Labor	Field production	hr.	128.00	4.00	512.00
	Related activities ^c	hr.	25.60	4.00	102.40
Subtotal					2,290.25
Interest, years 1 and 2 compounded at 10%, and on operating capital, year 3, 6 months @ 10%					453.10
Total, year 3					2,743.35
Total, years 1, 2 and 3					6,129.33

^aTrade names which appear in the table are intended only as an example--not as an endorsement.

^bThe cost per unit of farm machinery and equipment was adopted from Farm Planning Manual, Agricultural Extension Service, University of Tennessee, Knoxville, EC-622, revised April, 1978.

^cRelated production activities requiring labor (time) refer to activities not specifically listed such as time for doing repair work, purchasing supplies, complete banking requirements, loss of time due to weather, particularly rain, time associated with selling, and time losses between production activities. For purposes of this analysis hired labor was charged at the rate of \$4.00 per hour instead of \$3.50 per hour as reported in the pin oak bulletin [1].

Most of the details are self-explanatory, but some items require explanation. It was assumed that the seedlings were purchased rather than produced. Unskilled labor was assumed to cost approximately \$3.50 per hour including Social Security. However, labor was charged at \$4.00 per hour because the manager and supervisor at higher costs provide part of the labor. An interest charge of 10% was made on the operating capital for 6 months of the first year. The reason for the 6 months, or one-half of the

first year's operating capital charge, is to select an average sum of money invested in the crop.

One of the major variable cost items for the second year is the interest on the operating funds used during the first and second year. Custom harvesting costs contribute heavily to the third year costs. Cumulative variable costs over the 3-year period were estimated at \$6,129.

Next, the two components of costs are brought together in Table 5. More than 60% of production costs are in the fixed category.

Table 5. Estimated costs of producing 1 acre of oaks starting from seedlings and growing for three seasons before harvest

Growing period	Fixed costs ^a		1 acre	
	Entire nursery	1 acre	Variable cost	Total costs
-----dollars-----				
Year 1	89,257	2,975	2,663	5,638
Year 2	94,802	3,160	723	3,883
Year 3	100,902	3,363	2,743	6,106
Total		9,498	6,129	15,627
Per tree		2.40	1.55	3.95

^aObviously fixed costs vary from year-to-year; however, the same costs are used for all 3 years except for compounding of the interest. Interest was compounded for previous years and added to current year's interest.

Source: Tables 2 and 4.

In this case the cost of all salable trees at the end of the second year is needed. Costs associated with the third year are allocated only to the 1,200 plants dug that year.

The data in Table 6 presents the average cost of the 3,954 salable trees after the first 2 years. The costs of the harvested trees obviously are higher than those still in the field. Although a custom B&B charge of

Table 6. Estimated costs for producing 1 acre of oaks starting from seedlings with harvest during the second and third years

Growing period	Fixed costs		1 acre	
	Entire nursery	1 acre	Variable cost	Total costs
-----dollars-----				
Year 1	89,257	2,975	2,663	5,638
Year 2	94,802	3,160	723	3,883
Subtotal		6,135	3,386	9,521
Per tree ^a		1.55	0.86	2.41
Year 3	100,902	3,363	2,743	6,106
Additional cost per tree ^b		2.80	2.28	5.08
Total costs third year trees ^c		4.35	3.14	7.49

^aObtained by dividing the subtotals by the 3,954 salable plants.

^bObtained by dividing year 3 costs by the 1,200 trees remaining.

^cObtained by adding costs for the first 2 years to that for the third year.

\$.75 was involved, probably all costs including burlap, twine, and handling causes the cost to exceed the bare root one and those in the field by \$1.25. Thus, the 1,200 B&B plants can be estimated as follows.

On the average, each salable tree cost \$3.95; however, the B&B costs about \$1.25 each more than the bare root trees. Some additional mathematics is necessary to carry the costs further.

To illustrate rather than estimate three individual costs, let us estimate each a bare root and a B&B cost. For ease it is assumed that the B&B cost is \$1.25 per plant higher than the bare root one because of the digging, burlap, twine, and handling costs. The salable trees comprise 2,754 bare root and 1,200 B&B trees costing \$15,627. The following relationship can be set up:

$$\begin{aligned}
 \text{Let } X &= \text{cost of bare root} \\
 X + \$1.25 &= \text{cost of B\&B} \\
 \\
 2,754X + 1,200(X + 1.25) &= \$15,627 \\
 2,754X + 1,200X + \$1,500 &= \$15,627 \\
 3,954X &= \$15,627 - \$1,500 \\
 3,954X &= \$14,127 \\
 X &= \$3.57 \\
 X + 1.25 &= \$4.82
 \end{aligned}$$

Thus, bare root trees cost \$3.57 and B&B ones \$1.25 more or \$4.82.

It would be easy to distinguish between the two sizes of B&B with a little more work.

Normally, it would be expected that the B&B trees would sell for a higher premium than the cost difference above the bare root trees and certainly the larger B&B would sell for a considerably higher premium than the smaller B&B.

COST ESTIMATE FOR STAGGERED HARVEST

In order to be a little more realistic, all intermediate harvest is assumed to be at the end of the second growing season, 2,314 bare root trees 5'-6' (less the 160 tree loss due to grading) and 300 B&B 5'-6' trees are harvested. At the end of the third season the remaining 1,000 6'-8' and 500 8'-10' trees are dug.

Let X = cost of bare root (second year)
 X + \$1.25 = cost of B&B (second year)

$$\begin{aligned} 3,654X + 300(X + \$1.25) &= \$9,521 \\ 3,654X + 300X + \$375 &= \$9,521 \\ 3,954X &= \$9,146 \\ X &= \$2.31 \\ X + 1.25 &= \$3.56 \end{aligned}$$

The 2,314 bare root trees and the 1,500 trees remaining in the field averaged costing approximately \$2.31 while the 300 B&B 5'-6' trees cost \$3.56.

The actual cost for producing the 1,500 trees through the third year is slightly inflated by the harvesting costs associated with the harvest of the trees at the end of the second year but probably not by enough to revise the calculations to make a more accurate estimate. Although the 8'-10' trees sell for a considerably higher price than the 6'-8' ones, the actual difference in cost of production is little more than the difference in harvesting cost.

The staggered harvest clearly illustrates how rapidly cost per tree increases as the number per acre drops. The costs per acre associated with any one year is essentially the same as any other except for the planting and harvesting. Therefore, costs per tree are very sensitive to the number produced.

SUMMARY

The data in Table 7 summarize cost estimates by the various harvest methods and forms. The usual selling prices represent a considerably greater difference than that represented by the cost estimates for the clear harvest. However, the staggered harvest estimates probably better reflect the difference between small bare root and larger B&B selling prices.

Table 7. Comparison of cost estimates by various harvest methods and forms

Type harvest	Fixed	Variable	Total
	-----dollars-----		
<u>Clear harvest</u>	2.40	1.55	3.95
Bare root			3.55
B&B			4.80
<u>Staggered harvest</u>			
Second year	1.55	0.86	2.41
Bare root			2.31
B&B			3.56
Third year ^a			
Additional cost	2.80	2.28	5.02
Total	4.35	3.14	7.49

^aSum of second year costs and the additional costs associated with the third year.

Although estimating the differences in costs by sizes and forms of trees harvested may not be simple, knowing the costs for all produced on the unit of land allows for a comparison with the total receipts from the area.

The above estimates hopefully illustrate the necessity of including the charge for the owner-manager and the interest cost associated with investment and operating costs. Interest alone added approximately \$.91 above Schedule F costs per tree for the clear harvest method. If a nurseryman were borrowing all of the funds required to operate a nursery at today's interest rate, he would be very conscious of the cost.

Knowing the costs of production is necessary to correctly price the products grown and to place emphasis on the more profitable ones. Rapidly rising input prices makes this more important today than during past time periods when prices were more stable.

However, to do a good job of cost estimating, detailed records are needed to provide precision. The best approach is to develop a simple form to be completed each day which shows the allocation of labor, equipment, and materials to each field. Anything not allocated is assumed to be in the fixed cost or overhead category. Just being aware of how inputs were used may well be worth the effort to improve efficiency.

The first attempt at allocating costs between fixed and variable may require some thought; but once a scheme is worked out, very little time is required to use it. However, the system should be subject to review and revision. It is just a matter of time before many producers will be computerized. The same records and procedures are required regardless of which method of summary is used. Detailed records are needed for a year before a summary can begin. Having a system already in use before acquiring a computer will make the transition smoother.

LITERATURE CITED

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