

SECTION 6
ENGINEERING, ECONOMICS, STRUCTURES
AND INNOVATIONS

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A Computer Cost Estimator for Landscape Installation

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Nature of Work: Cost estimating and job bidding are among the most confusing and time-consuming tasks for landscape professionals. When done with pencil and paper, they are also very laborious tasks vulnerable to all sorts of mistakes. Yet estimating and bidding are crucial to business success (1,2). Landscapers must recognize and retrieve both fixed and variable costs from each job. Otherwise, insufficient profits and business failure may result.

A computer cost estimator, called HortScape, was developed as a teaching tool to help landscape professionals estimate both fixed and variable costs and formulate competitive bids on landscape installation jobs. It was developed for IBM compatible computers using SuperCalc 5 (IBM) spreadsheet software. Minimum operating requirements include a hard drive with at least 2 meg RAM and DOS 3.0 or higher. HortScape software and documentation are available from Extension Ag. Economics, The University of Georgia, Athens, GA 30602. SuperCalc 5 operating software must be purchased from private vendors.

Results and Discussion: HortScape is a menu-driven program that requires the user to build a series of preliminary data bases. In an ITEMS section the user inputs individual material, labor and overhead items specific to his firm. (Table 1). In a second section called TASKS, the user defines a series of generic tasks, such as planting a 1-gallon shrub, and identifies the associated items required to complete each task (Table 2). The user then instructs the program to translate the associated items from the ITEMS data base to the TASKS data base and to make the appropriate calculation.

Once these initial data bases are completed and saved, the user then advances to the ESTIMATOR component of the program and is ready to estimate a specific job. Here he inputs the appropriate code from the TASK list referring to the size of the plant material to be used, then inputs the name of the plant, unit cost and number of plants to be used on the job (Table 3). On command, the program translates the corresponding data from the previously built data bases to this portion of the program, makes appropriate calculations, and constructs a detailed listing of costs for equipment, labor and material. The program also prepares an OVERHEAD/SUMMARY page showing the direct costs, overhead costs, and total job costs plus overhead and profit (Table 4).

Finally, the user can instruct the program to print a LINE-ITEM BID SHEET for presenting to clients. This sheet itemizes the plants to be utilized on the job, quantity to be used, and their associated price (including profit and overhead).

Table 5 shows an overall schematic of the program that summarizes the flow of the HortScape program and indicates how the various components are linked together.

Significance to Industry: Computerized cost estimating helps ease the burden of manual estimating and provides landscape professionals with an accurate and effective tool for tracking costs from job to job while assuring profit and survival in today's competitive landscape market.

Literature Cited

1. Fee, S. H. 1987. Means landscape estimating. R. S. Means Co., Kingston, MA.
2. Vander Kooi, C. 1989. Estimating and management principles for landscape contractors. Charles Vander Kooi, Littleton, CO.

Table 1. Sample Items Input of HortScape

Item Code	Item	Units	Material Unit Cost	Equipment Cost/Hr	Labor Cost/Hr
1001	Humus	Cu. Ft.	0.30		
1002	Pine Straw	Bale	3.00		
1003	Staking Kit	Each	5.00		
1004	Topsoil	Cu.Yd.	12.00		
1005	Lime	lb.	.08		
1007	10-10-10	lb.	.10		
2001	Tractor	Hr.		20.00	15.00
2002	Backhoe	Hr.		30.00	15.00
2003	Tiller	Hr.		3.00	10.00
2004	Shovel	Hr.		.25	
3001	Supervision	Hr.			18.00
3002	Mobilization	Hr.			18.00
3003	Hauling	Hr.			0.00

Table 2. Sample Task Input of HortScape

Task Code	Descrip.	Labor Hours	Material Quantity	Item Code	Item	Unit	Material Unit Cost	Equip. Cost/Hr.
100	1-gallon	.05	.21	1001	Humus	Cu. ft.	.30	
			.07	1002	Pine Straw	Bale	3.00	
			.1	1007	10-10-10	Lb.	.10	
			.1	1010	TerraSorb	Lb.	6.00	
			1.0	2004	Shovel	Each	.25	

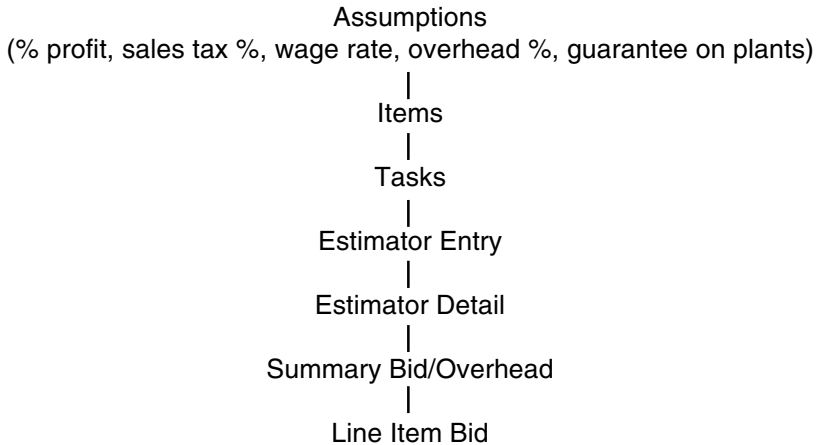
Table 3. Sample Estimator Input of HortScape

Task Code	Plant Name	Cultivar	Quantity	Unit Cost
600	Crepe Myrtle	Natchez	9	80.00
600	Leyland Cypress		8	70.00
700	Zelkova		2	125.00
500	Dogwood		3	65.00
300	Holly	Dwf. yaupon	18	7.50
100	Holly	Rotunda	65	1.25
33	Jessamine	Carolina Yellow	33	.80

Table 4. Overhead/Summary Page of HortScape

OVERHEAD SCREEN						
Alt-T to return to this screen						
Alt-M to return to the Estimator Menu						
Use the arrow Keys to move around the Spreadsheets						
Unit Cost	TOTAL	PERCENT	DOLLARS	% OF	OVERHEAD	TOTAL
Material	HOURS	OVERHEAD	BID AMT	DIR COST	RECOVERY	COST
CATAGORY						
SUMMARY						
		(%)	(\$)	(%)	(\$)	
MATERIAL		25.00%	10,243	77.58%	2,561	12,804
EQUIPMENT		25.00%	121	.92%	30	152
SUBCONTRACTOR		.00%	0	.00%	0	0
LABOR		38.64%	2,839	21.50%	1,632	4,471
DIRECT JOB COST			13,204	100.00%		
DIRECT JOB OVERHEAD			525			
TOTAL JOB COST- W/ OVERHEAD			13,729			
TOTAL PERCENTAGE- OVERHEAD RECOVER		30.76%				
OVERHEAD RECOVERED			4,223		4,223	
TOTAL JOB COST W/ OH			17,952			
PERCENT PROFIT ON TOTAL JOB	15.00%		2,059			
TOTAL JOB COST W/ PROFIT & OH			20,011	151.56%		

Table 5. Overall Schematic of HortScape



Influence of Row Spacing on the Cost of Field Produced Shade Trees in Hardiness Zone Six

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Nature of Work: Close plant spacing in nurseries has been used for decades in order to achieve maximum plant yield per unit of land. Today close spacing is usually identified with shrub production. Conifer and shade tree production has evolved to wider spacing with the advent of mechanical techniques used for maintenance and harvesting of these crops. The following is a look at the effect of different row and plant spacings on the cost of production for shade trees. Plant spacing in the row was varied between 3.5, 4, 5, or 6 feet. Spacing between rows included 8, 10 and 12 feet and variable spacing with 12 feet altered with 8 feet (12-8) and 12 feet altered with 8 feet twice (12-8-8).

Results and Discussion: Table 1. is a slight modification of a table in "Costs of Establishing and Operating Field Nurseries Differentiated by Size of Firm and Spacing of Plants in USDA Plant Hardiness Zones 5 and 6" (Taylor, et.al.). The nursery is modelled as a 200-acre nursery with 40 acres of production in shade trees. Seven acres are set aside for shade tree planting annually. Only 0.83% of the area is actually planted because of roadways, etc. Plants not harvested amounted to 10% of liners planted. Table 1. is based on 3.5 x 8 foot plant and row spacing. With this

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arrangement, 9086 liners were planted on 7 acres and 8177 plants were harvested. Coupled with other variable costs including an Oregon liner shipped into the Ohio River Valley, the variable cost for each harvested 2" caliper shade tree was \$32.33.

Fixed costs (\$88,905 ÷ 8177 [number of saleable plants] = \$10.87) from Taylor, et.al., were added to the variable costs (Table 2) to yield the total cost of each salable shade tree, \$32.33 + \$10.87 = \$43.20. For each additional plant and row spacing (Table 3.), Table 1. was changed by replacing only the value for the number of liners and the four values related to harvested plants (burlap, nails, etc.). The resulting total cost for each spacing (Table 3.) varied from \$43.20 for the 3.5 x 8 foot spacing to \$81.57 for the 6 x 12 foot spacing.

Significance to Industry: At least two reasons exist as to why a nursery might use any of these spacings. Row spacing will relate to harvesting techniques and equipment. With narrow row spacing, a tree spade will require an articulated loader in order to negotiate the row. Standard skid steer loaders cannot negotiate 8 foot rows, hence a wider row spacing is utilized. With increased plant spacing in the row, the shade tree has more room for canopy development. Thus, plant and row spacing is interrelated with product form, mechanization and production costs.

Item	Description	Unit	Cost per Unit (\$)	Quantity	Total Variable Cost (\$)
Materials					
Burlap	54"x54"syuares+24"basket	ea	3.10	8,177.00	25,349
Twine	Nails+twine	ea	0.15	8,177.00	127
Uners	6-8' 2 yr branched	ea	13.20	9,086.00	119,935
Strip tags	5/8' x 7" plasdc strip tags	ea	0.02	8,177.00	164
Poultry wire	1" for rabbit condrd	roll	29.00	9.00	261
Seed	Ryegrass (Kentucky 31)	lb	0.64	1,524.60	976
Chemicals					
	Custom spread, custom blend: 45-0-0, 0-44-0, 0-0-60 (fertilzer)	ton	176.00	3.95	695
	Custom spread (lime)	ton	20.00	7.00	140
	Urea, 45-0-0 (fertilzer)	ton	220.00	3.08	678
	Trifluralin 4EC (Treflan) (herbicide)	gallon	33.49	1.75	59
	Simazine 80WP (Princep) (herbicide)	lb	3.75	70.00	263
	DCPA75WP(Dacthal)(herbicide)	lb	6.37	196.00	1,249
	Malathion, 57EL (Cythion) (insecticide)	gallon	18.28	63.00	1,152
	Benomyl, 50WP (Benlate) (fungicide)	lb	14.17	42.00	595
	Carbaryl, 80WP (Sevin) (insectidde)	lb	6.09	105.00	639
	Other (i.e., Kelthane, Captan, Di-syston, etc.)				1,193
SUBTOTAL					154,575
Machinery and Equipment					
	Tractor, 100hp	hr	17.00	170.82	2,904
	Tractr, 60 hp	hr	11.68	102.20	1,194
	Tractor, 34 hp	hr	4.99	88.85	443
	Articulated loader/2,000 lb	hr	6.67	108.75	725

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

Table 1 continued from page 209.

Articulated loader/3,000 lb	hr	14.81	108.75	1,611
Tree spade	hr	5.30	543.07	2,878
Forks	hr	0.01	217.49	2
Plow, 3-14"	hr	6.57	5.60	37
Disk, 8' wide	hr	4.23	9.45	40
Harrow, 1 a wide	hr	8.45	0.84	7
Cultimulcher, 10'wide	hr	24.70	1.47	36
Spray rig with 10' boom	hr	2.77	10.99	30
Transplanter, 1-row(tree)	hr	0.92	165.20	152
Permanent irrigation/well and pump 100 hp	hr	7.60	26.00	198
Inground uri,qadon-s--rage/hdding	hr	5.65	12.00	68
Above ground irrigation-storage/holding	hr	11.05	12.00	133
In-ground irrigation-bed/field	hr	3.13	14.00	44
Traveler gun	hr	12.06	14.00	169
Portable PTO pump, 40 hp	hr	(no costs budgeted)		
Airblast sprayer	hr	1.01	84.00	85
Mower	hr	2.98	19.04	57
Seeder	hr	1.05	4.76	5
Sidedresser,2-row	hr	0.63	16.80	11
Culdvator,2-row	hr	0.95	18.48	18
Wagon, 4-wheel	hr	0.48	26.20	13
Truck, 1/2-ton pickup	hr	8.42	685.20	5,769
Flatbed truck, 24' bed	hr	14.87	545.07	8105
SUBTOTAL				24 734
Labor	Labor hours	hr	9.24 **	6,320.04
	Related labor hours, 20%	hr	9.24	1,264.00
SUBTOTAL				70,076
Interest Charge on Computed at 12%on an annual	%	6.0	249,385.00	14,963
Operating Capital basis for six months		(.06)		
TOTAL VARIABLE COSTS				264,348
Variable Cost Units (2" Caliper) available				
Salable Plant for sale in a given year	ea		8,177.00	32.33

Total nursery = 200 acres, with 175 acres of growing space and 25 acres in production facilities, hdding and field bed area, roads, etc.

Shade Trees = 40 acres, with 0.83% in growing space and 0.17% in production fadlities, hdding and field bed area, roads, etc. 8,177 2" caliper salable plants per year.

Quantity discounts were applied to chemicals and other items.

** Average basic wage before withholding taxes and fringes benefits=\$7.00, taxes and fringe benefits add 32% or \$2.24 for a total of \$9.24.

To acheive better wpest and disease control, alternative chemical usage is advisable. Alternative chemical costs were estimated at 50% of the cost of Malathion, Benomyl, and Carbaryl.

Literature Cited

1. Taylor, R.D., Kneen, H.H., Smith, E.M., Hahn, D.E., and Uchida, S. 1986. "Costs of Establishing and Operating Field Nurseries Differentiated by Size of Firm and Species of Plant in USDA Plant Hardiness Zones 5 and 6," Southern Cooperataive Series Bulletin #315, The Ohio State University, Wooster, Ohio.

Table 2. Summary of Fixed, Variable and Total Costs (Dollars) per Salable Plant of Operating a 200-Acre* Field Nursery, USDA Plant Hardiness Zones 5 and 6, 1991.

Item	Shade Tree (<i>Acer rubrum</i>) Cost per Salable Plant	Percent of Total Cost
Fixed Cost Items:		
Land and Improvements	2.66	6
Buildings	0.83	2
Machinery and Equipment	3.12	7
General overhead	4.00	9
Interest on General Overhead, Insurance and Taxes	0.27	1
Subtotal	10.87	25
Variable Cost Items:		
Propagation	++	
Materials	18.90	44
Machinery and Equipment	3.02	7
Labor	8.57	20
Interest on Operating Capital	1.83	4
Subtotal	32.33	75
Total Costs per Salable Plant	43.20	100

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

Table 3. Total Cost per Salable Plant Depending Upon Row Spacing of Field-Grown Shade Trees, USDA Plant Hardiness Zones 5 and 6, 1991.

Row Spacing (Ft.)	Liners Purchased (No.)	Plants Harvested (No.)	Variable Cost/ Saleable Plant (\$)	Total Cost/ Saleable Plant (\$)
8 x 3.5	9,086	8,177	32.33	43.20
8 x 4	7,910	7,119	34.30	46.79
8 x 5	6,321	5,689	38.16	53.80
8 x 6	5,271	4,744	41.96	60.70
10 x 3.5	7,224	6,501	35.75	49.43
10 x 4	6,321	5,689	38.16	53.80
10 x 5	5,061	4,555	42.91	62.44
10 x 6	4,214	3,792	47.72	71.17
12 x 3.5	6,020	5,418	39.10	55.52
12 x 4	5,271	4,744	41.96	60.70
12 x 5	4,214	3,792	47.72	71.17
12 x 6	3,514	3,162	53.45	81.57
(12-8)x 3.5	7,224	6,501	35.75	49.43
(12-8)x 4	6,321	5,689	38.16	53.80
(12-8)x 5	5,061	4,555	42.91	62.44
(12-8)x 6	4,214	3,792	47.72	71.17
(12-8-8)x 3.5	7,742	6,968	34.64	47.41
(12-8-8)x 4	6,776	6,098	36.87	51.45
(12-8-8)x 5	5,418	4,876	41.34	59.57
(12-8-8)x 6	4,515	4,063	45.81	67.69

Economics of Leasing Land for Nursery Production

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Nature of Work: Land owners often ask, "What is my grassland or pasture worth?" Across the fence, nurserymen needing land for field production of landscape plants ask, "What can I afford to pay for leasing pasture or grassland?" Economics tells us land is worth whatever two parties can agree. While that is true, it doesn't lead us to a particular value. Certainly, the landowner wants reimbursement for ownership costs, plus some profit, as well as expecting property (pasture) quality to be at least maintained, K not improved. The nurseryman also wants some return above costs on his venture.

Discussion of the basics of long-term land leasing may be helpful. Examples and prevailing prices may help even more, as this article provides.

Results and Discussion: Pasture leases vary by type. Should a lease go by the acre? In the short run, the weather may not cooperate. Should the land be leased by the block (homogeneous planting)? Nursery stock prices may turn down. Many leases are designed to help with such questions, and are discussed below.

In the Southeast, most production leases on permanent pasture are priced by the acre, and run for multiple years. For the nurseryman, a longer lease provides more security, and often allow him to make plans or participate in land improvements he might not otherwise be interested in. The landlord may be more inclined to favor a shorter lease, since an undesirable arrangement can be terminated quickly, although he may stand to lose security and other benefits provided by a more stable arrangement.

Per acre leases are simple. The most difficult problem may be in calculating the acreage, since timber, roads, farmsteads and other areas may be nonproductive. Some long-term leases on rather poor grassland appear to go for a bargain, perhaps only enough to keep the ad valorem or property taxes paid. In such situations, the nurseryman usually maintains the fences and pays for all the production inputs, such as lime, mowing, etc. The arrangement is essentially a one-man operation suited for absentee or elderly land owners.

Other per acre leases specify higher prices on improved pastures in relatively good condition and with fair to adequate fencing, water and working facilities. Ordinarily, \$120 to \$150 per acre is a common range for permanent pastures with the improved entitlements furnished by the

landowner.

Some nursery leases are figured by the block, and may be either short or long-term. Per block leases do require a bit more bookkeeping, since the rates differ among plant types, and the plant numbers may vary among blocks and over time as, for instance, shade trees are dug and marketed.

Per block leasing agreements receive little use in the Southeast. When observed, block leases are typically for shade trees initially spaced for sale as large caliper merchandise, with the lease price dependent upon the anticipated value of the planted nursery stock in the particular block.

A **share lease** divides either the gains or profits between the parties. Economics tells us that, ideally, revenues should be shared between parties as costs are shared. Of course, this balance is tipped one way or the other according to the respective bargaining power of the parties.

Normally the cost of providing the pasture is borne by the landlord. The nurseryman also has costs, including the capital costs of providing the plant materials, production inputs, marketing, overhead and management. In order to determine an equitable division in a share lease, the parties list projected costs and revenues. The parties then distribute revenues according to the way each contributes to the costs. This gives the "ideal" share, which may be subject to negotiation. An example of a share lease follows. Farmer Brown plans to have 50 acres of pasture available, well-fenced and water available, buildings suitable for office and restrooms, plant and supply storage and machinery storage and shop, and is willing to put up five polyhouse structures for nursery business use. Nurseryman Green wants to lease these 50 acres adjoining his existing landscape nursery. Brown and Green strike an agreement. Brown provides the land and improvements while Green agrees to use his own equipment, labor and management to produce 8 acres each of Acer rubrum (2"-caliper shade tree), Malus (1 1/2"-caliper ornamental tree), Viburnum (3'-4' deciduous shrub), Juniperus (18"-24" rapid-growing evergreen) and Taxus (18"-24" slow-growing evergreen), plus pay all operating costs. How will they split the proceeds upon sale of the nursery stock?

Brown and Green draw up a budget; this budget is based upon Southern Cooperative Series Bulletin 315 (Taylor, et al, 1986) on field nurseries costs. The way they split the fixed and variable expenses indicates a 6:1 ratio (Green:Brown) on incurring costs. Hence, this ratio would be applied to the profits from selling these five plants. Using the budgeted costs and anticipated selling prices, for leasing the 50 acres Farmer Brown would receive \$21,256 while Nurseryman Green would retain the remaining \$127,538 in profits, based upon their decision on how to split costs.

Brown	Green	Expenses
\$ 35,304		Land ownership costs, fixed costs
\$ 23,698		Buildings/improvements, fixed costs
	\$ 65,868	Machinery/equipment, fixed costs
	\$102,960	Overhead/management, fixed costs
	\$ 55,114	Variable costs, <u>Acer rubrum</u>
	\$ 53,682	Variable costs, <u>Malus</u>
	\$ 27,644	Variable costs, <u>Viburnum</u>
	\$ 25,712	Variable costs, <u>Juniperus</u>
	\$ 25.524	Variable costs. Taxus
<hr/>		
\$ 59,002	\$356,502	Total costs incurred

Based upon the anticipated marketings and profits for each plant, as noted below, the total profits of \$148,794 would be shared in the 6:1 (Green:Brown) ratio consistent with the expenses.

	<u>Profits. ea.</u>	<u>Marketings</u>	<u>Total Profits</u>
<u>Acer rubrum</u>	\$11.00	1,869	\$ 20,559
<u>Malus</u>	\$11.00	2,732	\$ 30,052
<u>Viburnum</u>	\$ 6.00	6,208	\$37,248
<u>Juniperus</u>	\$ 5.50	5,810	\$ 31,955
<u>Taxus</u>	\$ 7.00	4,140	\$ 28.980
<hr/>			
Total Profits, 50 acres (40 acres of production)			\$148,794

Significance to the Industry: Leasing land for nursery production occurs and it is helpful to both the landlord (landowner) and tenant (nurseryman) to understand the economics and types of land leases.

Literature Cited

1. Taylor, Reed D., Harold H. Kneen, Elton M. Smith, David E. Hahn and Stanley Uchida. 1986. Costs of Establishing and Operating Field Nurseries Differentiated by Size of Firm and Species of Plant in USDA Plant Hardiness Zones 5 and 6. Southern Cooperative Series Bulletin 315 and The Ohio State University Research Bulletin 1177.

Cost of Field-Grown Plants: A "Lotus" Computer Program for Estimating Cost

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Nature of Work: This paper presents the outline of a "Lotus" computer spreadsheet program which can be used to estimate the cost of field-grown nursery stock. The spreadsheet contains a model field nursery as an example and guide. Users can estimate their own cost of production by adjusting the example to reflect size or cost differences between the example and their own operation. The program provides detailed fixed and variable cost information along with numerous efficiency factors. In addition, the program allows users to perform "what-if" types of operations which are useful for financial planning purposes.

The program uses a similar format to the spreadsheet program Cost of Greenhouse Plants by Larry A. Johnson at the University of Tennessee. The Tennessee program is a revised and expanded version of the original program A Greenhouse Cost Analysis written by Kelly, Rathwell and Luke from Clemson University. Size of operation, production practices and cost of materials for the example were obtained from the Planning Budget for Nursery Stock and Christmas Trees by Larry A. Johnson and Kenneth M. Tilt.

Results and Discussion: The program includes a series of tables where users can adjust the example for the fixed cost of facilities, general overhead, operating information and variable cost for up to four different types of field-grown nursery stock. The program analyzes the cost of production for Youngstown Andorra Juniper, Forsythia, Dogwood and Red Maple. Separate columns, highlighted in green, are listed for users to include specific information about their own operation.

The following list is a summary of the tables. Tables to be adjusted by users: (A) General Production and Asset Inputs, (B) Asset Years of Life and, and (D) Annual Overhead Cost Estimates. Tables Calculated by the Computer: (C) Output Information: Investment and Fixed Cost Estimates, (E) Container-Grown Plant Fixed and Variable Cost Computation, and (F) Monthly Allocation of Building, Equipment, and Overhead Cost.

The computer program is complex in the manner by which it handles overhead costs. Overhead costs are assigned depending upon when the different plants are in the field and the relative amount of acreage required by each. Variable costs are determined in units of one-thousand plants, which allows the user to adjust the number of plants of each type produced,

and costs will be determined automatically.

Significance to Industry: The computerized spreadsheet program allows a field-grown nursery grower with only a limited number of financial records to approximate the cost of production on a per plant basis. The program is also useful for financial planning once the nursery's cost structure is modeled within the program.

The following is a partial list of tables included in the computer program. The example information is for example only! A more complete study of current cost in a bona fide research survey is needed before the example is technically correct. The program will be available for public distribution in the near future.

Literature Cited

1. Crafton, V.W., T.D. Phillips and T.M. Blessington. Cost of Producing Woody Ornamental. Research Report 137, Mississippi State University, 1992.
2. Johnson, L.A. Cost of Greenhouse Plants. unpublished computer program, Agricultural Extension Service, University of Tennessee, 1990.
3. Johnson, L.A. and Kenneth, M. Tilt. Planning Budgets for Nursery Stock and Christmas Trees. EC 1019. University of Tennessee, Knoxville, Tennessee, January 1989.

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

C. * OUTPUT INFORMATION: INVESTMENT AND FIXED COST ESTIMATES *****

Item	No.	Per Unit Value	New Invest.	Average Invest.	Years Of Life	Annual Deprec.	Interest 10%	Total
Land	50	\$1,500	\$75,000	\$37,500			\$3 750	\$3 750
Buildings-Office	1.0	\$15,000	\$15,000	\$7,500	20.0	\$375	\$750	\$1,125
Polyhouses-No Heat	3.0	\$2,500	\$7,500	\$3,750	10.0	\$375	\$375	\$750
Polyhouses-Heat	2.0	\$2,500	\$5,000	\$2,500	10.0	\$250	\$250	\$500
Storage/Shop Building:	1.0	\$10,000	\$10,000	\$5,000	25.0	\$200	\$500	\$700
Concrete/Paving	1.0	\$5,000	\$5,000	\$2,500	15.0	\$167	\$250	\$417
Holding/Shipping	1.0	\$500	\$500	\$250	10.0	\$25	\$25	\$50
Irrigation System	1.0	\$2,500	\$2,500	\$1,250	20.0	\$63	\$125	\$188
Mist System	8.0	\$350	\$2,800	\$1,400	10.0	\$140	\$140	\$280
Uiring	8.0	\$200	\$1,600	\$800	20.0	\$40	\$80	\$120
Tractor, 65 HP	2.0	\$20,000	\$40,000	\$20,000	7.0	\$2,857	\$2,000	\$4,857
Tractor, 35 HP	1.0	\$12,000	\$12,000	\$6,000	7.0	\$857	\$600	\$1,457
Tractor, 19 HP	1.0	\$8,000	\$8,000	\$4,000	7.0	\$571	\$400	\$971
Articulated Loader	1.0	\$30,000	\$30,000	\$15,000	10.0	\$1,500	\$1,500	\$3,000
Forks	2.0	\$1,100	\$2,200	\$1,100	7.0	\$157	\$110	\$267
Flatbed Truck, 1.5 T.:	1.0	\$20,000	\$20,000	\$10,000	10.0	\$1,000	\$1,000	\$2,000
Plow	1.0	\$1,000	\$1,000	\$500	10.0	\$50	\$50	\$100
Disk	1.0	\$2,000	\$2,000	\$1,000	10.0	\$100	\$100	\$200
Harro-	1.0	\$300	\$300	\$150	10.0	\$15	\$15	\$30
Cultimulcher	1.0	\$5,000	\$5,000	\$2,500	10.0	\$250	\$250	\$500
Rotovator	1.0	\$2,300	\$2,300	\$1,150	10.0	\$115	\$115	\$230
Sprayer, 100 gal.	1.0	\$700	\$700	\$350	7.0	\$50	\$35	\$85
Sprayer, Back Pack	3.0	\$90	\$270	\$135	7.0	\$19	\$14	\$33
Transplanter, field	1.0	\$2,000	\$2,000	\$1,000	10.0	\$100	\$100	\$200
Transplanter, ro-bed :	1.0	\$2,000	\$2,000	\$1,000	10.0	\$100	\$100	\$200
Transplanter, tree	1.0	\$1,000	\$1,000	\$500	10.0	\$50	\$50	\$100
Airblast Sprayer	1.0	\$6,000	\$6,000	\$3,000	7.0	\$429	\$300	\$729
Rotary Tiller, 8 hp	1.0	\$1,500	\$1,500	\$750	7.0	\$107	\$75	\$182
Undercutter, 50 "	1.0	\$400	\$400	\$200	7.0	\$29	\$20	\$49
U Blade	1.0	\$500	\$500	\$250	7.0	\$36	\$25	\$61
Fert. Sidedresser	1.0	\$860	\$860	\$430	10.0	\$43	\$43	\$86
Cultivator, 2 row	1.0	\$625	\$625	\$313	7.0	\$45	\$31	\$76
Rotary Mower	1.0	\$1,000	\$1,000	\$500	7.0	\$71	\$50	\$121
Wagon	2.0	\$950	\$1,900	\$950	10.0	\$95	\$95	\$190
Truck	1.0	\$12,000	\$12,000	\$6,000	7.0	\$857	\$600	\$1,457
Package Machine	1.0	\$4,100	\$4,100	\$2,050	10.0	\$205	\$205	\$410
Pallets	50.0	\$20	\$1,000	\$500	2.0	\$250	\$50	\$300
Shears	5.0	\$14	\$70	\$35	5.0	\$7	\$4	\$11
Cyclone Seeder	2.0	\$25	\$50	\$25	20.0	\$1	\$3	\$4
Tools	1.0	\$2,000	\$2,000	\$1,000	7.0	\$143	\$100	\$243
Tree Spade	1.0	\$8,000	\$8,000	\$4,000	4.0	\$1,000	\$400	\$1,400
Other	1.0	\$0	\$0	\$0	0.0	\$0	\$0	\$0
Miscellaneous	1.0	\$0	\$0	\$0	0.0	\$0	\$0	\$0
Total			\$ 293675	146838		12744	14684	27427

Total (Incl. Land) Annual Building/Equipment Cost

\$27,427

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

D. ** ANNUAL OVERHEAD COST ESTIMATE **

	* TOTAL Ours	ANNUAL COST * Yours	Final	PERCENT OF TOTAL OVERHEAD & FIXED COST	PERCENT OF OVERHEAD & FIXED COST
Salaries	\$30,000		\$30,000	52.2%	35.3%
Payroll Tax	\$2,325		\$2,325	4.0%	2.7%
Unemployment Comp.	\$300		\$300	0.5%	0.4%
Workman's Comp.	\$450		\$450	0.8%	0.5%
Insurance	\$3,000		\$3,000	5.2%	3.5%
Water & Sewer	\$600		\$600	1.0%	0.7%
Telephone	\$1,300		\$1,300	2.3%	1.5%
Fuel (Heating)	\$1,000		\$1,000	1.7%	1.2%
Electricity	\$2,000		\$2,000	3.5%	2.4%
Repairs & Maintenance	\$3,000		\$3,000	5.2%	3.5%
Property Tax	\$2,937		\$2,937	5.1%	3.5%
Advertising	\$2,000		\$2,000	3.5%	2.4%
Truck Expense	\$6,000		\$6,000	10.4%	7.1%
Bad Debt	\$1,000		\$1,000	1.7%	1.2%
Professional Fees	\$500		\$500	0.9%	0.6%
Supplies	\$300		\$300	0.5%	0.4%
Miscellaneous	\$800		\$800	1.4%	0.9%
Total Annual Overhead Cost			\$57,512		
Total Annual Overhead Cost Per Acre				\$1,437.79	
Total Annual Overhead Cost/Sq. Ft. Growing Area :				\$0.04	
Total Annual Overhead and Building/Equipment Cost Per Acre					\$2,123
Total Annual Overhead and Building/Equipment Cost/Sq Ft Growing Area:					\$0.05

E. *** CONTAINER GROUU PLANT VARIABLE COST COMPUTATION ***

Dogwoods			
E. (1)	*** GENERAL ASSUMPTIONS	ENTRY VARIABLES	***
ENTER HERE ==>			
Number of Plants:	24503	Acres	9
Percent Loss:	10%	Plants/Ac	2723
Planting Mo. number:	1		
Polyhouse Spacing(in)	3.25		
Field Spacing (Feet)	4		
Months in Polyhouse	18		
Months in Field	30		
Planned Mark-up (Pct)	50%		
E.(2) *** CALCULATED VALUES ***			
Plants Available For Sale	22052		
Sq. Ft. Polyhouse Space	1797.3		
Sq. Ft. Field Space	392040		
% Polyhouse Space	20%		
% Nursery Growing Area	25%		

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

*** CURSOR RIGHT FOR ADDITIONAL CROPS ***

E.(3) *** VARIABLE COST ESTIMATE Dogwoods ***

Name	Cost Total	Cost Per	Unit Per	Unit Quantity	Cost Containe
------	------------	----------	----------	---------------	---------------

MATERIAL COST ENTER HERE >>>>	<<<<<<ENTER HERE				
	Price and Quantity	Total Plants			
	per 1000 plants	24502.5			

Propagation					
Containers (Pots)	thou	\$50.00	2.1	\$2,573.99	\$0.105
Plsstic Trays	ea.	\$0.50	39.0	\$477.80	\$0.020
Plastic	sq. Ft.	\$0.03	2956.0	\$2,172.88	\$0.089
Shade cloth	sq. Ft.	\$0.10	1367.0	\$3,349.49	\$0.137
Media	cu. yd.	\$14.00	2.0	\$686.07	\$0.028
Rooting hormone	pt.	\$14.00	0.4	\$137.21	\$0.006
Fungicide	lb.	\$12.60	1.3	\$395.18	\$0.016
Micromax	lb.	\$0.10	3.7	\$9.07	\$0.000
Fertilizer	lb.	\$1.00	110.0	\$2,695.28	\$0.110
Insecticide	gal.	\$50.00	0.2	\$257.28	\$0.011
Fuel and repairs	thou	\$32.00	1.0	\$784.08	\$0.032
Labor	hr.	\$5.25	50.0	\$6,431.91	\$0.263
Other	Unit	\$0.00	0.00	\$0.00	\$0.000
Propagation Variable Cost			19970.2235	\$0.408	
Field Production					
Granular fertilizer lbs.	\$0.07	300.00	\$514.55	\$0.021	
Slow release fert. lbs.	\$1.00	0.00	\$0.00	\$0.000	
Fungicide (Manzate) lb.	\$2.50	5.10	\$312.41	\$0.013	
Fungicide (Subdue) pt.	\$20.00	3.70	\$1,813.19	\$0.074	
Insecticide(Dursdan)gal.	\$50.00	0.85	\$1,041.36	\$0.043	
Herbicide	qt.	\$8.20	1.50	\$301.38	\$0.012
Fuel and repairs	thou.	\$80.00	1.00	\$1,960.20	\$0.080
Labor	hr.	\$5.25	105.00	\$13,507.00	\$0.551
Harvest/haul	thou	\$2,000.00	1.00	\$49,005.00	\$2.000
Other	Unit	\$0.00	0.00	\$0.000	
Field Production Variable Cost			\$68,455.08	\$2.794	
Interest Expense			\$7,423.82	\$0.303	
Total			\$95,849.12	\$3.912	

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

E.(4) ** Cost Summary And Sale Price Projection **		
	Total Cost	Cost Per Tree
Variable Cost	\$95,849	\$4.35
Allocated		
Fixed & Overhead Cost	\$54,655	\$2.48
Fixed/O'head&Variable	\$150,504	\$6.82
Unallocated		
Fixed & Overhead Cost	\$0	\$0.00
Total		
Fixed & Variable Cost	\$150,504	\$6.82
		To Cover
		Allocated Cost Total Co
*** ESTIMATED SALE PRICE	=====>	\$10.24 \$10.24

**Establishing and Operating a Garden Center:
Requirements & Costs**

Susan S. Barton (Delaware), John J. Haydu (Florida), Roger A. Hinson (Louisiana), Robert E. McNiel (Kentucky), Travis D. Phillips (Mississippi), Russell D. Powell (Pennsylvania), Forrest E. Stegelin (Kentucky)

Nature of Work: In the decade of the 1980s, the nursery/greenhouse industry grew at an average annual rate of 10 percent, and now accounts for over 10 percent of all farm crop cash receipts at \$8.1 billion in 1990. Alone, nursery crops cash receipts in the US were \$5 billion in 1989—nearly a 15 percent increase over the value in 1983 (3).

There has been little research support to assist the entrepreneur in estimating the costs of establishing and operating a retail garden center. The lack of information combined with impressive industry growth (5,10,11,12) indicates a need to fill this void; hence the impetus for this study is provided.

The specific research objectives were as follows:

- I. Estimate establishment and operating costs for garden centers with two levels of sales by:
 - (A.) surveying existing garden centers to determine facility requirements, scale of operation, product mix, customer flows, marketing data, and related economic and financial information;
 - (B.) describing representative facilities, based on differences in business volume, physical layout, marketing strategy, and related factors;
 - (C.) developing capital budgets, including investment and operations costs, for the representative firm sizes.

- II. Specify the general set of financial, marketing and business principles that should be available to and evaluated by the owner/manager of a garden center by:
 - (A.) evaluating the financial and income performance of the representative firms, compared to standard business indicators; and
 - (B.) developing a merchandising program, composed of layout, pricing, advertising, cost structure, and diversification that contributes to business success.

Materials and Methods: A survey of twenty-five garden centers was completed in 1990. These firms represented existing businesses whose primary activity was the retail sale of plants and complementary hard goods. These firms of varying size highlighted a cross-section of the United States in terms of climatological zones, population densities, plant species, disposable incomes and market environments. Data collected included a description of the physical facilities, equipment and personnel requirements, product mix profiles, and marketing and financial evaluations.

Economic engineering models were synthesized and created from the above information to describe one small and one large representative garden center firm. The representative small garden center's facilities and operations were sufficient to generate gross annual sales of \$350,000. The larger retail garden center's facilities and operations were representative of a business having gross annual sales of \$1 million. The large and small firms were modeled to portray realistic differences in the options available to garden center operators. This information can be used by garden center managers as a menu to create a unique model that resembles his or her own firm.

Results and Discussion:

Capital Investment: Two model firms were synthesized to represent typical garden center characteristics for two sizes of firms (Tables 1 and 2). In order to create workable models, each firm is assumed to be a garden center whose sole activity is the retail sale of plants and supplies. In reality, garden centers may include a variety of related businesses such as nursery production, landscape installation or landscape maintenance.

Product Mix and Turnover: The annual turnover for the alternative firm sizes was designed to be essentially the same except that garden center A had a higher turnover of container trees and shrubs (Table 3). For purposes of estimating inventory, a weighted annual average turnover was calculated for each garden center.

In order to ascertain cost of goods, an estimate of gross margins was necessary for each category of items in the product mix. The gross margin was calculated the same for each garden center. Gross margin ranged from a low of 40 percent for hardgoods to 75 percent for B & B trees and shrubs.

Financial Statements: The purpose of this section is to present the financial information for two representative garden centers based on specific operating assumptions. The two major financial documents are the income statement and the balance sheet. These forms help businesses organize financial information for tax preparation and ratio calculation. The ratios are used: as diagnostic tools to assess the strengths and weaknesses of a company; as indicators of progress to chart company growth; and as tools for future planning.

Income Statement - The average percentage cost of goods was obtained by multiplying the individual percentage cost of goods items by the appropriate percentage of product mix. This resulted in an estimated cost of goods of 47.23 percent for garden center A and of 45.20 percent for garden center B (Table 3). However, these data assume that the desired gross margin is achieved. This relationship is not realized because merchandise losses, damaged merchandise, volume discounts, and mark-downs for sales reduce the margin achieved. Therefore, the average cost of goods estimates were increased by five percent to adjust for these deviations. In some cases, the five percent adjustment will be low relative to actual experience. If extensive mark-downs will be used, initial mark-ups should be higher or the targeted gross profits will not be achieved. In order to illustrate the potential profits from the garden centers, pro forma income statements were derived (Tables 4 and 5).

A new garden center could not open for business and achieve its designed level of capacity in sales in the first year or two, a consideration when

interpreting the pro forma income statements.

Payroll taxes, etc. were assumed to be 20 percent of salary cost. If the business is incorporated, the owner-manager's salary is considered as an expense. If the business is not incorporated, the funds taken from the business by the owner-manager for his/her contribution are not considered as a business expense, but rather profit would be increased by this amount. Withdrawals would reduce contributions equity as shown in the net worth statement and on the balance sheet.

Other items, except depreciation, were derived with the assistance of survey data and garden center operating cost studies. These items were generally estimated as percentages of sales. The items could be expected to vary considerably by business organization and location. Property taxes, insurance rates, advertising rates, and utilities will vary widely with location. Advertising was placed at 2.5 percent but, in early years, it should be much higher to draw attention to the new business.

Neither garden center was expected to have accounts receivable. However, bank credit cards were assumed for each.

As a percentage of sales, garden center A, after achieving its \$1,000,000 in annual sales, was projected to have a profit of nearly \$93,984 or 9.4 percent. Garden center B had \$42,342 in operating profit on \$350,000 in sales or 12.1 percent.

Based on the percentage of sales, garden center B has a higher cost in salaries but less in insurance, depreciation, utilities, and in repairs and maintenance. Also, because garden center B carried a smaller proportion of its sales in the relatively low mark-up hard goods, its gross profits expressed as a percentage were higher.

Balance Sheet - Pro forma balance sheets at the end of the third year were developed for both garden centers (Tables 6 & 7). There were at least two reasons for selecting a time period beyond the initial year. First, the year should represent a time period in which some depreciation has occurred. Second, for purposes of calculating returns on equity, a sufficient passage of time was needed for the garden center to fully develop its sales potential.

The balance sheets contained in Tables 6 and 7 were based on the assumption of total ownership of the assets except for outstanding accounts payable. This situation is referred to as a 100 percent equity situation in the data presented in Table 8. Garden center A represented a 9.8 percent return on equity (ROI) at 100 percent ownership while garden center B had a return of 12.1 percent. Neither of these ROI's would be considered as outstanding because entering business is a risky venture.

Since not many businesses are fully owned by the owner, especially at the start, the influence of other levels of equity were explored (Table 8). The method used to explore these possibilities was to decrease equity by a selected percentage and to add 12 percent to these borrowed funds as

interest, which was subtracted from income. At the 50-percent and 25-percent equity situations, ROI declined to 7.6 percent and 3.1 percent, respectively for garden center A.

For garden center B, the 50-percent equity gave a return of 12.2 percent and the 25-percent equity returned 12.5 percent. Thus, increasing borrowed funds decreased return on equity for the larger garden center but slightly increased ROI for the smaller one.

These two situations represent a good example of financial leverage at work. Borrowed funds cost 12 percent in each case. However, in the case of the larger business, earnings were initially below 12 percent; therefore, an unfavorable leverage situation existed causing income to be decreased proportionately more than equity. On the other hand, the smaller garden center was initially earning 12.1 percent. The borrowed funds resulted in a favorable leverage situation which enhanced ROI.

Significance to Industry: Firm size in the retail garden center industry is a continuum, including many small, locally owned and operated firms that capture a relatively small portion of sales, and fewer large firms that capture the majority of sales. With the industry's growth, the number of actual and potential garden center entrepreneurs has increased. In at least some of these cases, the decision to invest in a garden center is based on a knowledge of and an interest in plants. Alone, this interest is insufficient to be successful — it must be combined with effective feasibility analysis and business management, financial planning and marketing strategies. The overall objective of this analysis is to provide economic and technical information to potential and current garden center operators and managers, as well as members of the business community who work with garden centers, on the resources (financial and otherwise), costs and procedures involved in establishing and operating a garden center.

Managers of existing or prospective garden centers should be able to use the procedure outlined by adapting the material in the tables contained in the complete publication to make a similar analyses for their situation. These model garden centers serve as an example to illustrate the evaluation process.

Table 1. Capital requirements for garden center "A" with annual sales of \$1.000 000, 1991

Item	Total Cost
Land & Improvements	\$667,128
Buildings	275,095
Equipment	88,180
Total	\$1.030.403

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

Table 2. Capital requirements for garden center "B" with annual sales of \$350,000. 1991.

Item	Total Cost
Land & Improvements	\$276,848
Buildings	54,885
Equipment	21,445
Total	\$353,178

Table 3. Product turnover and initial cost of goods calculations for two selected garden centers. 1991.

	Weighted annual ave. turnover	Cost of goods ^{a/}	Adjusted cost of goods ^{b/}
GC A	4.69	47.23	49.59
GC B	4.59	45.20	47.46

^{a/}Percent of total sales
^{b/}Increased 5% to account for merchandise losses, damaged merchandise, volume discounts, and mark-downs for sales

Table 4. Pro forma income statement for garden center "A" with \$1,000,000 in sales.

Items	Dollars	Percent of Sales
Sales	1,000,000	100.0
Cost of goods	496,000	49.6
Gross profit	504,000	50.4
Expenses	410,016	41.0
Net profit before taxes	93,984	9.4

Table 5. Pro forma income statement for garden center "B" with \$350,000 in sales.

Item	Dollars	Percent of Sales
Sales	350,000	100.0
Cost of goods	166,110	47.5
Gross profit	183,890	50.4
Expenses	141,548	40.4
Net profit before taxes	42,342	12.1

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

Table 6. Pro forma balance sheet at end of third year of operation for garden center "A" with \$1,000,000 in sales

Current assets	\$ 115,757
Fixed assets	880,448
Total assets	996,205
Total liabilities	35,000
Equity	\$ 961,205

Table 7. Pro forma balance sheet at end of third year of operation for garden center "B" with \$350,000 in sales.

Current assets	\$ 38,690
Fixed assets	319,284
Total assets	\$ 357,974
Total liabilities	8,500
Equity	\$ 349,474

Table 8. Effect upon return on investment of alternative equity position for selected garden centers after three years of operation.^{a/}

Item	Garden Center					
	A			B		
	Percent equity			Percent equity		
	100%	50%	25%	100%	50%	25%
Income (\$)	93,984	36,312	7,476	42,342	21,405	10,889
Equity (\$)	961,205	480,602	240,301	349,474	174,737	87,368
ROI (%)	9.8	7.6	3.1	12.1	2.2	12.5

^{a/}Equity based on original investment depreciated for three years. Income for the 50% and 25% equity positions reduced by 12% interest on the debt.

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Cash Flow Analysis for a Container Nursery for Alternative Start-Up Scenarios

**Kenneth W. Hood and Travis D. Phillips
Mississippi**

Nature of Work: Studies of cost of producing woody ornamentals in containers have generally indicated the enterprise to be profitable. The research procedure has been to identify the investment in land, buildings, and equipment for the nursery and then to budget out several species of plants representing a high proportion of the nursery's production.

This research was undertaken to ascertain the cash flow situation for a model nursery for three start-up scenarios. For each scenario 80 percent and 60 percent levels of debt were assumed. The scenarios were (1) propagation of all liners, (2) purchase of all liners, and (3) purchase liners

the first year and simultaneously begin to propagate liners for the second year and thereafter. Cash flow budgets were estimated for ten years for each of the six situations. The assumption was made that all capital assets would be purchased. Short-term financing was assumed to be repaid for the first two years with principal repayment to begin in the third year. An interest rate of 10 percent was assumed for all borrowed funds. The investment in land building and equipment is described by the data contained in Table 1. Data contained in Table 2 show the annual cash fixed costs.

Table 1. Estimated capital requirements for a container-grown nursery with 8 acre bed space, beginning with propagation, Climate Zones 7 and 8, 1990.

Item	Total Cost
Land and Improvements	\$30,000
Buildings	233,745
Machinery	90,130
Total Investment Cost ^a	\$355,875

Source: Foshee, K.H., T.D. Phillips, A.J. Laiche, Jr. and S.E. Newman. 1990. Cost of Production Estimates for Container-Grown Landscape Plants, Climate Zones 7 and 8, 1990. Agricultural Economics Research Report No. 189, Mississippi Agricultural and Forestry Experiment Station.

^aIf liners are purchased, Scenario II, investment costs are \$85,320 less or \$270,55 because propagation greenhouses are not needed.

Table 2. Estimated annual fixed costs for a container-grown nursery with 8-acre bed space, beginning with propagation, Climatic Zones 7 and 8, 1990.

Item	Annual Cash Fixed Costs
Land and Improvements	\$600a
Buildings	4,715a
Machinery and Equipment	1,804a
General Overhead	97,500b
Total Annual Cash Fixed Costs ^c	\$104,619

Source: Foshee, K.H., T.D. Phillips, A.J. Laiche, Jr. and S.E. Newman.

1990. Cost of Production Estimates for Container-Grown Landscape Plants, Climate Zones 7 and 8, 1990. Agricultural Economics Research Report No. 189, Mississippi Agricultural and Forestry Experiment Station.

aTaxes and insurance

^bUtilities, management salaries, repairs and maintenance, insurance, advertising, nursery and office supplies, license, bonds, professional dues, and travel

^cIf liners are purchased, Scenario II, annual cash fixed costs are \$8,306 less or \$96,313.

Five crops, azaleas, Burford holly, junipers, crapemyrtles, and photinia, were used to represent broad groups of plants grown in Climate Zones 7 and 8. Two budgets were developed for each species to represent producing the plant at the desired time and an alternative budget was developed to represent beginning production at a later time. The schedule of production for the preferred or usual time is illustrated by Figure 1.

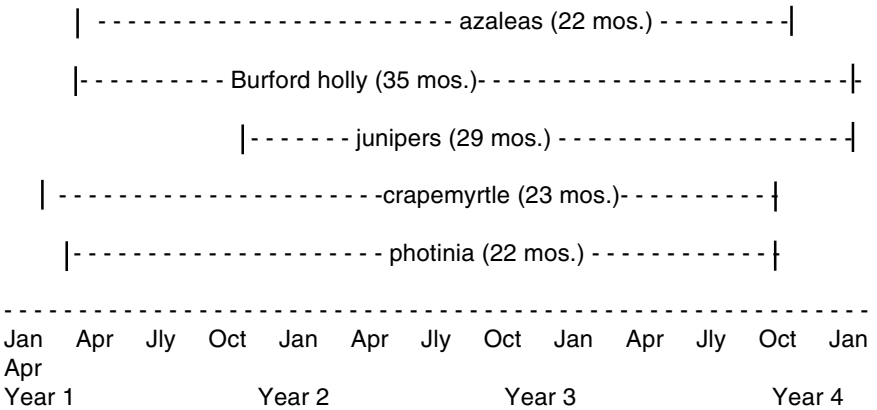


Figure 1. Months required for the production of selected container-grown woody ornamentals, following usual production methods, from propagation to harvest.

The crop mix used in the study was one developed by Hall in his optimum crop mix to maximize profits. The costs of production budgets, representing an update of Hall's budgets by Foshee, were the basis of the model nursery.

Results and Discussion: Analyses were made using several approaches. What appeared to be the best situation varied somewhat dependent upon the analysis used.

Of course, the 80 percent debt situation did not compare favorably with the 60 percent rate of borrowing. Hindsight indicates that perhaps we should also have included a 40 and a 20 percent level of borrowing. However, the same relative relation would have held among the three scenarios.

Using cash available after debt payment at the end of each of 10 years as a means of comparisons, Scenario I (propagate the liners) was still in debt by more than \$146,000 after 10 years (Table 3.) Purchasing liners (Scenario II) had a negative cash flow of more than \$113,000 while Scenario III (purchase first five year liners and propagate thereafter) had a positive cash position of more than \$80,000. Because of funds required for purchasing liners in the first year while propagating them for the second year, Scenario III had the largest negative cash flow at the end of the first year.

"SNA RESEARCH CONFERENCE - VOL. 37-1992"

Table 3. Comparisons of cash available after debt payment for three scenarios, container-grown landscape plants for a 12-acre nursery with 8 acres of bed space, Climate zones 7 and 8, 1991^a

Year	Scenario I ^b	Scenario II ^c	Scenario III ^d
	— — — — — \$ — — — — —		
1	-346,901	-600,745	-647,605
2	-363,698	-112,085	-205,400
3	-352,763	-65,197	-18,189
4	-53,183	12,482	17,764
5	-97,486	-16,514	21,363
6	-87,486	-35,710	36,043
7	-109,759	-42,738	47,123
8	-115,912	-62,321	61,802
9	-125,411	-81,713	76,482
10	-146,451	-113,640	80,081

^aBased on initial 60 percent debt situation

^bPropagate liners

^cPurchase liners; funds made available initially to purchase for first two years

^dPurchase liners for first year and begin to propagate liners for second year and thereafter.

Another method of comparing production scenarios was to observe the beginning and ending equity position after 10 years. For this comparison, an inventory of plants at market value and other assets at book value was considered. The standard practice of propagating liners and growing them out (Scenario I) required less funds initially but was negative by more than one-quarter million dollars after 10 years. Scenario II (exclusively purchase liners) required more initial equity than III because funds for purchasing liners for two years was set aside for II. However, only purchasing liners for the initial year (Scenario III) was far superior to II.

Table 4. Beginning and ending equity position for a 10-year period for three scenarios, container-grown landscape plants for a 12-acre nursery with 8 acres of bed space, Climate zones 7 and 8, 1991.^a

Equity	Scenario I ^b	Scenario II ^c	Scenario III ^d
	— — — — —	\$ — — — — —	
Beginning(e)	142,350	216,766	196,622
Ending(f)	-254,365	-130,541	313,245

^aBased on 60 percent debt situation

^bPropagate liners

^cPurchase liners; funds made available initially to purchase liners for first two years.

^dPurchase liners for first year and begin to propagate liners for second year and thereafter.

^eBeginning cash balance for year one.

^fIncludes \$403,765 for inventory of plants and other assets at book value.

The internal rate of return was calculated for each situation. This is a measure of returns to be compared with the cost of borrowed funds. Purchasing liners only (Scenario II) had an IRR of only 4.2 percent , Scenario I (propagate liners) was 8.7 percent and Scenario III was 9.1 percent, respectively. Unless long-term debt could be secured very cheaply, none would be considered a good investment. What do these analyses tell us about a new nursery where everything is purchased at the beginning? Even at a relatively low interest rate of 10 percent, the nursery generally will not cash flow if extensive borrowed funds are involved.

In summary, buying liners compared with producing them has little to offer except getting into production initially. The investment in propagation greenhouses is not needed but payment for the liners requires a large cash outlay. A more dependable liner source and better labor utilization are in favor of propagation. However, if up front funds are available, the initial purchase of liners and immediate propagation was the superior scenario for the nursery situation studied. Perhaps what was learned was the need to continue to do research in this area.

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