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PHYSICAL REQUIREMENTS AND COSTS OF ESTABLISHING AND OPERATING AN EIGHT ACRE (GROWING SPACE) CONTAINER NURSERY IN U.S.D.A. PLANT HARDINESS ZONES FIVE AND SIX

BY

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INTRODUCTION

To make more informed decisions as to whether to enter, leave, or expand container production, nurserymen require production, marketing and financial information. In this paper, a cost model for production of crops representing five categories of container-grown production schemes in U.S.D.A. Plant Hardiness zones five and six is provided. Physical coefficients are included so the information can be readily updated and so individual nurserymen can use the model as a standard against which to compare their own operations or planned operations. Information derived should provide a basis for decision-making for those evaluating the profitability of establishing a new container nursery,

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expanding an existing container nursery, or shifting from field production to container production.

Production costs models have been developed for several species of plants in the Southern and North Central regions of the U.S. (1,3,4,5,6,7,8,9,10,11). Most of these models, while providing excellent information for individual species, did not attempt to develop comprehensive models for complete nursery operations. Taylor, et at., developed comprehensive models applicatle to U.S.D.A. Plant Hardiness Zones 5 and 6 for both Container- and Field-grown crops representing, in each case, five categories of production schemes and two sizes of nurseries (12,13). Badenhop and Phillips (2) developed a similiar study for field-grown crops in U.S.D.A. Plant Hardiness Zones 7 and 8 also representing five categories of field-grown production schemes and two sizes of nurseries. The purpose of this paper is to report on the smaller container model developed by Taylor, et. al., for U.S.D.A. Plant Hardiness Zones 5 and 6. The comprehensive model reported only for U.S.D.A. Plant Hardiness Zone 6. Subsequent discussions with horticulturists and agricultural economists indicated that the model was also appropriate for Zone 5. This paper therefore reports the results as applicable to both Zones.

OBJECTIVES

The general objective of this paper is to present the resources and costs associated with the establishment and operation of a model nursery, including the delineation of representative container production systems. Specific objectives were to:

1. Model a series of production systems that would accomodate a majority of the species of plants being container-grown in U.S.D.A. Plant Hardiness Zones 5 and 6.
2. Analyze the important species of plants commonly grown in containers in U.S.D.A. Plant Hardiness Zones 5 and 6 and assign each of them to one of five designated groups based on similarities of growing and production requirements.
3. Choose one species from each group as representative of the group for detailed cost analysis.
4. Design physical facilities including land areas, land improvements, irrigation systems, buildings, machine and equipment components.

MATERIALS AND METHODS

In the study, a model firm was synthesized using the conceptual framework of economic engineering wherein the 'best proven practice' was included in the model. It was synthesized based on the Columbus, Ohio area. The complete synthesis included developing an appropriate production cycle; schematic drawings of the physical layout, including buildings and irrigation system; lists of equipment and other items; a complete sequence by month and year of nursery operational steps beginning with the purchase of plant liners and ending with loading the finished product for wholesale distribution; and budgets for fixed and variable costs (12).

Data for this study were obtained from wholesale nurseries and nursery suppliers in the North Central region during 1982. If specific items were required (i.e. depth of the well), coefficients were based on the Columbus, Ohio area. The basic goals in synthesizing the production facilities (see Figure 1) were to minimize labor expenses, flow and movement of plant material and equipment, water runoff, and initial investment, and to maximize the number of salable plants and allow future expansion.

Production System

The production system chosen for the five groups of plants represented in this analysis consists of utilizing two or three year old bareroot liners to produce a salable plant within two growing seasons. These 6-7" liners are transplanted directly into two gallon (8-1/2" x 8") copolymer containers during the month of May. Approximately 10% of the

crop will be sold during the fall of the second growing season (approximately 18 months), 15% during March and 50% during April after the second growing season (approximately 22-23 months), and 25% during May after the second growing season (24 months). May is a period when clean-up sales are being made and new plants started. This production system saves transplanting as the plants are sold in the same two gallon containers in which they were started.

Physical Plant and Equipment

Assumptions

Assumptions about the physical facilities and equipment can greatly affect its cost and thereby cost per annual salable plant. The authors included all items a nursery would typically require, thus the physical plant is probably more elaborate than many nurserymen would require. A nurseryman can easily eliminate or reduce items as required. However, it would require substantial effort to do the analysis on his own if they were not included. Some specific assumptions that add substantially to a "stripped down" facility are as follows:

Scale of Nursery Operation. It was assumed the model nursery would be self sufficient. Most containerized nurseries also have field production with buildings, machinery and equipment being shared between operations. Shared facilities would significantly reduce costs associated with the container operation.

Site. Land modification costs could be reduced if the nursery were located on gravelly or sandy soil with good

natural drainage. Locating near a river or other natural water source could reduce or eliminate the need for a well.

Expansion. Expansion potential was provided for. It became obvious very quickly in the analysis that buildings, machinery and equipment needed for an efficient operation were adequate for a much larger system. A significant stumbling block to expansion, if just an adequate system were provided, would be in the irrigation components. For this reason, a larger irrigation pump, larger well casing diameter, and larger in-ground water mains were provided.

Machinery and Equipment. Purchase of new machinery and equipment was assumed for the model nursery. Many nurserymen may choose to buy used equipment, rent equipment or time-share some expensive items with other nurseries.

General

A model facility was synthesized for the nursery (340,000 sq ft of growing area, Fig 1). Specific components for the nursery are itemized in Table 2. Discussion on the components can be found in S-103 Regional Bulletin 301 (13).

Enterprise Mix

We assumed that our model nursery would produce a diverse line of nursery stock, each having a two year production cycle. Commonly grown nursery stock was divided into five cultural groups. While not all inclusive, the groups do permit a range of per unit costs to be developed as they relate to input costs and cultural factors. For analytical purposes, we assumed that each cultural group would occupy 20% of the growing area (i.e. 68,000 sq ft per

group). The operation would be comprised of 198,745 plants in full production. Annual sales capacity would be 95,650 plants. For detailed analysis, one specific plant from each group was chosen as representative of the group. While it is recognized that other plants from each category would have somewhat different requirements, it was felt that the requirements would not vary significantly in cost from the representative plant. The five groups, with some of their cultural characteristics are listed below:

Group	Plant	Cultural Characteristics
I	SPREADING EVERGREENS *Juniperus chinensis* (varieties) *Juniperus horizontalis* (varieties) *Thuja* occ. woodwardi	Hardwood bark medium, minimal overwinter structure, 12-15" salable plants
II	SPREADING DECIDUOUS SHRUBS *Berberis t.* 'Crimson Pygmy' *Cotoneaster apiculata* *Cotoneaster horizontalis* *Cotoneaster dammerii* *Euonymus fortunei*	Hardwood bark medium, maximum overwinter structure, 12-15" salable plants.
III	SLOW GROWING EVERGREENS *Taxus* (species) *Buxus* (species)	Pinebark medium, minimal overwinter structure, 12-15" salable plants.

IV UPRIGHT DECIDUOUS SHRUBS *Euonymus alatus compacta* *Viburnum* (species) *Weigela* *Forsythia* *Ligustrum vicaryi*	Hardwood bark medium, minimal overwinter structure, 18-24" salable plants.
V BROADLEAF EVERGREEN *Rhododendron* *Pieris* *Pyracantha*	Pinebark medium, maximum overwinter structure, 15-18" salable plants.

Production Cost Budgets

Costs were established for all factors of production including management and invested capital. In economic terms, costs associated with factors of production inputted by owner/operators are often referred to as 'opportunity costs' or the income these factors could have received if they were employed elsewhere. For example, owners could usually be employed as managers at other nurseries, and money invested in land, buildings, irrigation systems, and equipment could have earned interest if it had been placed in financial institutions.

Capital requirements per salable plant capacity by spacing and size of nursery were first established (Table 1). Second, capital requirements for establishing the nurseries were determined (Table 2). Third, annual fixed costs were calculated (Table 3). Fourth, variable costs were determined (Table 4). Fifth, summaries were made for fixed and variable

costs for each of the plant groups (Tables 5 and 6). This allowed cost comparisons based on cultural group.

Most nurseries use cash rather than accrual accounting procedures. For this reason, the analyses were completed on a "cash" basis.

Annual fixed costs are presented in Table 3. Most of these derived costs were based on the physical plant and equipment discussed previously. These costs were grouped into five categories: land and land improvements, buildings, machinery and equipment, general overhead, and opportunity cost of capital for general overhead, insurance and taxes. Fixed costs for land and land improvements, buildings, and machinery and equipment were composed of depreciation, interest, insurance, and taxes. To determine annual fixed costs per cultural group, total annual fixed costs were simply divided by five.

Variable costs include all cost factors that vary with the quantity of plants being grown at one point in time. For example, the number of liners required for spring planting depends upon the quantity of plants management desires to have in inventory plus production losses. A loss factor of 5% was assumed with 2 1/2% being taken in the first production year and 2 1/2% in the second. Variable costs were subdivided into the following categories: materials, machinery and equipment, labor, and interest on operating capital (Table 4).

After all cost factors were determined, they were summarized based upon cost per salable plant by group and size of nursery (Table 6).

RESULTS AND DISCUSSION

Capital Investment Requirements

Capital investment requirements for establishing container nurseries were itemized under three broad divisions: land and improvements, buildings, and machinery and equipment (Tables 2). Each was further divided into several components. The nursery required $592,921 in investment. Land and land improvements represented 34% or $202,941 of the investment, buildings 35% or $206,243, and machinery and equipment 31% or $183,737.

Land improvement costs, including the pond, were between 5 and 6 times as expensive as the land itself (Table 2). These expenses would be necessary in 'normal' U.S.D.A. Plant Hardiness Zones 5 and 6 areas to provide drainage, water storage, and a good work area in times of inclement weather.

Building needs included a simple office layout, a potting shed for nursery stock receipt and storage, machinery shop for repairs and storage, and polyhouses for overwintering.

An important consideration for managers in most industries is determination of investment per unit of production capacity. For container nurseries this indicator would be the capital requirement per-salable-plant capacity. This indicator was determined for each of the five groups of plants (Table 1). To determine this figure it was necessary to determine how many salable plants would be produced annually for each group in its allocated 20% of the growing

space. This value ranged from a low of 13,050 for Group V (Rhododendron) to 25,600 for Group I (Juniperus). The number of plants grown per unit of space directly relates to the capital requirements per-salable-plant. These costs differentiated by plant group were: $4.63 for group I (Juniperus), $5.72 for Group II (Cotoneaster), $5.90 for Group III (Taxus), $7.33 for Group IV (Viburnum) and $9.09 for Group V (Rhododendron). The average for all groups was $6.20.

Examination of the data indicate higher investment costs per unit of salable plant capacity would incur as container nursery size is decreased. This would be caused by spreading the cost of fixed items such as buildings, equipment, and machinery over fewer units. Conversely, lower costs per unit of salable plant capacity would be realized for container nurseries larger than those analyzed as the costs of fixed items would be spread over more units.

Individual nurserymen could, of course, incur somewhat different costs than those presented. Individual costs would depend upon variables such as production cycle chosen, labor productivity, and ability to bargain with suppliers. The nurseryman also may choose not to provide for future expansion, choose land that would require minimum drainage modifications, reduce optimal growing/overwintering space requirements, or operate used equipment. This analysis assumed average soil conditions, expansion capacity, optimal spacing configurations, new buildings, equipment and machinery.

Annual Costs

Fixed costs associated with capital investment including depreciation, interest, insurance and taxes were $139,680 per year. In addition there was $95,025 allocated for general overhead and $7,885 for interest on general overhead, insurance and taxes resulting in a total of $242,590 total fixed costs for the nursery (Table 3). These costs were divided equally between the five plant groups with each group receiving an assessment of $48,517 (Table 5).

On a per-salable-plant basis, there was a considerable difference in fixed costs when they were differentiated by plant group (Table 6). They were: $1.90 for group I (Juniperus), $2.34 for group II (Cotoneaster), $2.42 for group III (Taxus), $3.00 for group IV (Viburnum), and $3.72 for group V (Rhododendron). The average over all groups was $2.53. Annual fixed costs for group V were more than double those for group I. These costs were proportionate to the number of salable plants per annum produced in allocated space. Fixed costs as a percentage of total costs ranged from 42% to 51% and averaged 46% for the five groups (Table 6).

Nurserymen having established facilities might well consider annual fixed costs to be lower than those reported here. This is especially true if they calculate depreciation and repairs on the original value of land improvements, buildings, machinery and equipment and if they place a low value on their own management input. Good management, for planning purposes, however, dictates computing depreciation

and repairs on replacement value rather than on original cost. It also dictates placing a value on managerial time that would be comparable to salaries paid in competitive firms.

Variable costs are detailed in Table 4. Total variable costs by plant group were $66,584 for group I (Juniperus), $55,865 for group II (Cotoneaster), $63,544 for group III (Taxus), $46,038 for group IV (Viburnum), and $47,358 for group V (Rhododendron). Total for all groups was $279,389 (Table 5). The difference in total annual variable costs between groups is primarily accounted for by the number of plants in the group. The fewer the plants, the fewer the containers, soil mixture, liners, labor to move containers, etc. On a per-salable-plant basis, the group costs were practically reversed (Table 6). Variable costs by plant were $2.60 for group I, $2.70 for group II, $3.16 for group III, $2.84 for group IV, and $3.63 for group V and averaged $2.93 for all groups. In groups with fewer plants, greater costs were incurred on a per plant basis for polyethylene film, chemicals, machinery, equipment, and labor. Other variable costs that changed substantially between groups were the cost of liners and for groups II (Cotoneaster) and V (Rhododendron) the addition of thermal blankets for overwintering protection. Variable costs for the small nursery ranged from 49% to 58% of total costs and averaged 54% for all groups (Table 6).

Total costs are the summation of fixed and variable costs. They were $115,101 for group I (Juniperus), $104,382

for group II (Cotoneaster), $112,061 for group III (Taxus), $94,555 for group IV (Viburnum), and $95,875 for group V (Rhododendron). For all groups they totaled $521,974 (Table 5). On a per-salable-plant basis they were $4.50 for group I, $5.04 for group II, $5.58 for group III, $5.84 for group IV, and $7.35 for group V and averaged $5.46 for all groups (Table 6).

SUMMARY AND IMPLICATIONS

Total annual costs per salable plant differentiated by species ranged from $4.50 to $7.35 and averaged $5.46 for all species. Fixed costs per salable plant ranged from $1.90 to $3.72 and averaged $2.53. Fixed costs as a percentage of total costs ranged from 42% to 51% and averaged 46%. Variable costs per salable plant showed substantial differences among plant species. They ranged from $2.60 to $3.63 and averaged $2.93. Major differences among species affecting variable costs were spacing requirements, cost of liners and overwintering requirements. Variable costs as a percentage of total costs ranged from 49% to 58% and averaged 54%.

Implications

A comparison of total annual costs of producing plants with prices in U.S.D.A. Plant Hardiness Zone Five and Six producers' wholesale catalogs would undoubtedly show, in a great many cases, selling prices lower than total annual costs. In fact, if one were to add costs of selling, very few producers would presently be charging enough to cover all costs let alone profits. How then can producers continue to operate? The answer lies in how producers both experience and compute costs. We have used the economic and accounting method which includes both explicit and implicit costs. Explicit costs are those that are paid directly and easily determined, e.g. cost of liners, soil media, fertilizers, labor, etc. Implicit costs are those that are more difficult to determine

such as the cost of equity capital and managerial capacities. The way these costs are determined varies significantly from firm to firm. Well established nurseries are usually very accurate in determining explicit costs, but often do not consider all implicit costs. They base their costs on "cash flow" and profit and loss on "tax accounting". These established nurseries, may have purchased land at low cost, be working with depreciated equipment and may be assigning low if any value to their management; in this case determined costs would be at a much lower level than presented in this paper. Also, as pointed out earlier, careful site selection could significantly reduce fixed (overhead) costs. However, if one were to start a new container nursery, in a "normal" U.S.D.A. Plant Hardiness Zone Five or Six site, costs would probably be very close to those presented here.

For the industry, selling nursery products for below "accounting costs" implies that well established nurseries, operating essentially debt free, would have strong staying power whereas those who have just started or are heavily in debt may not be able to survive, especially if they are relying on their container operation to meet all overhead expenses. Second, starting a container nursery in U.S.D.A. Plant Hardiness Zone Five or Six would probably not prove profitable unless items like buildings, equipment, machinery, management, etc., could be shared with other enterprises or unless selling prices of nursery products in the zone increased substantially. At current prices for nursery

products, this study shows that the return on investment for establishing new, independently operating, container nurseries in U.S.D.A. Plant Hardiness Zone Five or Six would be marginal if not negative.

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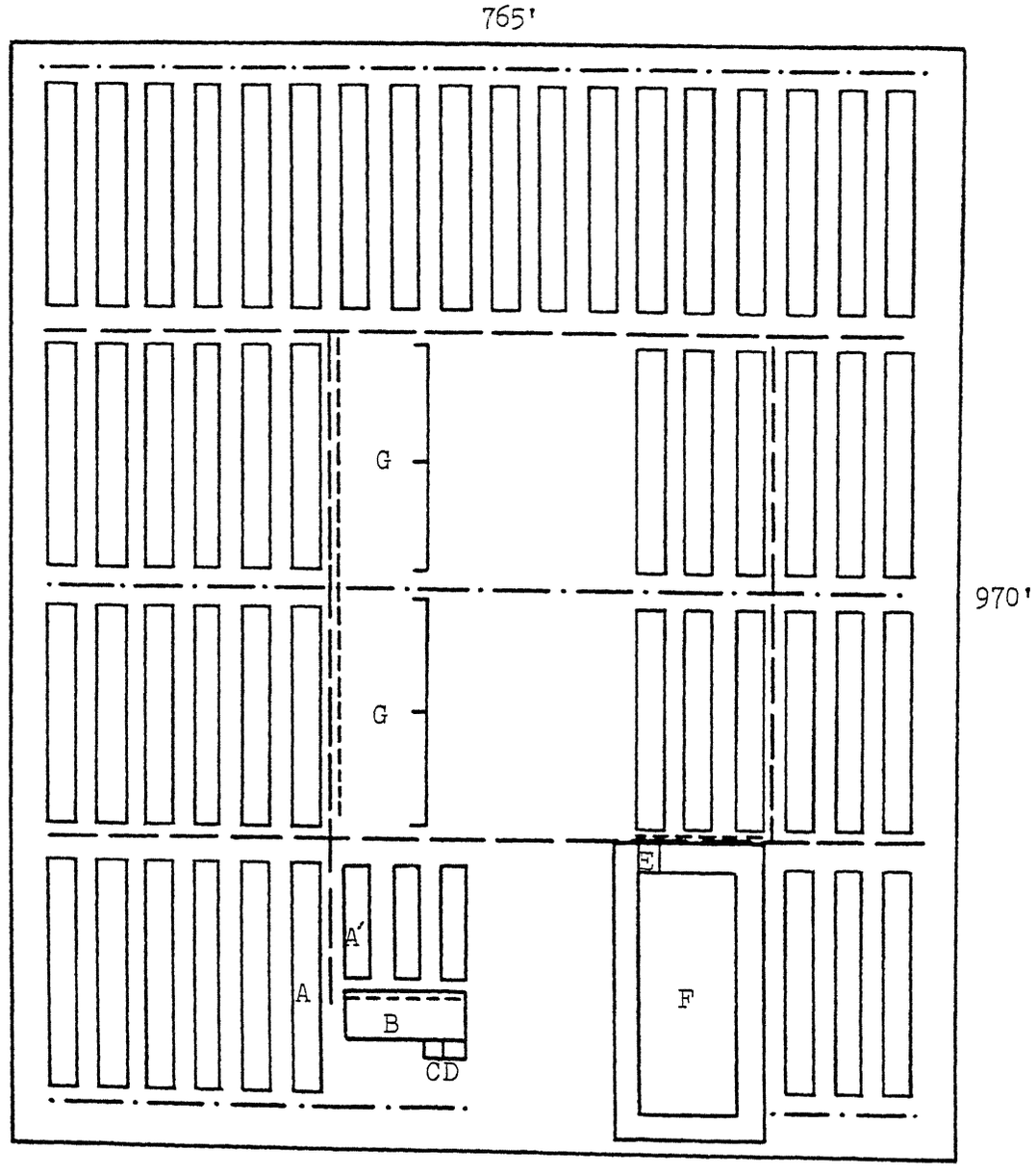
Figure 1: Schematic Drawing of an Eight Acre (Growing Space) Container Nursery, U.S.D.A. Plant Hardiness Zones Five and Six.



A. Polyhouse structure, 200' x 20'
A'. Polyhouse structure, 100' x 20'
B. Supply shed, machinery shed, machine shop, 40' x 100'
C. Office, 20' x 20'
D. Restrooms, 20' x 20'
E. Pump house, 10' x 10'
F. Pond, 80' x 120', 14' deep
G. Shipping area, 4 semi truckloads

Drainage Tile, 30" :·— · —·
Watermain, 8" PVC :— — —
Watermain, 6" PVC :— — — —
Watermain, 4" PVC :- - - - - -

Scale : 0' 100' 200'

Total Acreage = 765' x 970' = 742,050 sq. ft. = 17.04 acres
Total Polyhouse Acreage = 52.5 eq.(20' x 200') = 210.000 sq. ft. = 4.82 acres
Total Growing Space = 87.5 eq.(20' x 200') = 350,000 sq. ft. = 8.03 acres

TABLE 1.--Capacity in Number of Plants and Capital Required per Salable Plant Capacity by Spacing for an Eight Acre* (Growin Space) Container Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1982.

Group	Growing Cycle Spacing				Production factors		
	Growing Season On-center (inch)	First Year Over-Wintering (inch)	Second Growing Season On-center (inch)	Second Year Over-Wintering (inch)	Total Plants in Production (units)	Salable Plants per Year (units)	Capital Requirements per Salable Plant Capacit (dollars)
I - Juniperus	9	9	15	12	53,120	25,600	4.63
II - Cotoneaster	12	9	15	15	43,095	20,730	5.72
III - Taxus	9	9	18	15	41,750	20,085	5.90
IV - Viburnum	12	12	21	15	33,655	16,185	7.33
V - Rhododendron	12	12	18	18	27,125	13,050	9.09
					=======	======	====
Totals					198,745	95,650	6.20

*Total Nursery - 17.04 acres, 340,000 sq ft of growing space, 204,000 sq ft of polyhouse space. Each group of plants would occupy 20 percent of the growing (60,000 sq ft) and polyhouse (40,800 sq ft) space.

TABLE 2.--Capital Requirements for an Eight Acre* (Growing Space) Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1982.

Item	Description	Unit	Useful Life (years)	Quantity	Cost per Unit (dollars)	Total Cost (dollars)	Percent of Total Cost
Land	Unimproved land	Acre		17.04	1,850	31,524	5
+ Improvements	Grading, tiling, graveling, pond		20			171,417	29
Subtotal						202,941	34
Buildings							
Office and restrooms	20′ x 40′ cement block	sq ft	20	800	28	22,400	4
Potting and packing shed	40′ x 50′ steel pole insulated	sq ft	20	2000	18	36,000	6
Machinery storage, shop	40′ x 50′ steel pole insulated	sq ft	20	2000	18	36,000	6
Polyhouse structures	200′ x 20′ pipe frame	each	10	51	2,193	111,843	19
Subtotal						206,243	35
Machinery and Equipment							
Tractor, 60 HP	60 HP, gas fuel with front end loader	each	10	1	16,000	16,000	3
Tractor, 28 HP	28 HP, gas fuel	each	10	2	6,025	12,050	2
Manure spreader	130 bu capacity	each	10	1	2,135	2,135	**
Wagon	4 wheel, self steering	each	10	2	2,300	4,600	1
Irrigation pump/well	75 HP electric pump	each	20	1	40,085	40,085	7
Inground irrigation system	PVC pipe/valves		20		38,801	38,801	7
Above ground irrigation system	PVC pipe/sprinklers		5		19,383	19,383	3
Fertilizer injector	200 gal	each	5	1	6,500	6,500	1
Airblast sprayer	300 gal, on trailer	each	7	1	6,955	6,955	1
Cyclone spreader	Hand operated	each		1	40	40	**
Forklift	3000 lb lift exterior wheels	each	10	1	24,000	24,000	4
Truck	1/2 ton pick-up	each	5	1	8,000	8,000	1
Pallets	Wooden	each	2	349	12	4,188	1
Handtools	Miscellaneous		5		1,000	1,000	**
Subtotal						183,737	31
TOTAL						592,921	100

*17.04 acres, 340,000 sq ft growing space, 204,000 sq ft of polyhouse space.
**Less than half of 1%.

TABLE 3. Annual Fixed Costs (Dollars) for an Eight Acre* (Growing Space) Container Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1982

Item	Description	Depreciation**	Interest***	Insurance and Taxes	Total
Land	Unimproved land		4,739	631	5,370
+ Improvements	Grading, tiling, graveling, pond	8,571	25,713	3,428	37,712
Subtotal		8,571	30,452	4,059	43,082
Buildings					
Office and restrooms	20′ x 40′	1,120	3,360	568	5,048
Potting and packing shed	40′ x 50′	1,800	5,400	913	8,113
Machinery storage and shop	40′ x 50′	1,800	5,400	913	8,113
Polyhouse structures	200′ x 20′	10,066	16,777	2,835	29,678
Subtotal		14,786	30,937	5,229	50,952
Machinery and Equipment					
Tractor, 60 HP	60 HP, gas fuel w/front-end loader	1,440	2,400	73	3,913
Tractor, 28 HP	28 HP, gas fuel	1,085	1,808	55	2,948
Manure spreader	130 bu capacity	192	320	10	522
Wagon	4-wheel	414	690	21	1,125
Irrigation pump/well	75 HP, electric pump	1,804	6,013	182	7,999
Inground irrigation system	PVC pipe/sprinklers	1,940	5,820	176	7,936
Above ground irrigation system	PVC pipe/sprinklers	3,489	2,908	88	6,485
Fertilizer injector	200 gal injector	1,170	975	30	2,175
Airblast sprayer	300 gal, on trailer	894	1,043	36	1,973
Forklift	3,000 lb lift, exterior-use wheels	2,160	3,600	109	5,869
Truck	1/2 ton pickup	1,440	1,200	36	2,676
Pallets	Wooden	1,047	628		1,675
Handtools	Miscellaneous	200	150		350
Subtotal		17,275	27,555	816	45,646
General Overhead					
Utilities	Telephone, electric, gas heat				5,325
Licenses and bonds					375
General repairs and maintenance	Buildings, grounds				6,140
Advertising and printing					1,050
Insurance, personnel	Workmen's comp., FICA, health, unemp.				19,060
Travel and other					1,500
Professional fees					75
Administrative and Management	Clerical, operator, supervisory, labor and office supplies				60,500
Miscellaneous					1,000
Subtotal					95,025
Interest on General Overhead, Insurance, and Taxes	Compounded at 15% per annum for 6 months				7,885
Total Annual Fixed Costs					242,590

*17.04 acres, 340,000 sq ft growing space, 204,000 sq ft of polyhouse space.
**Depreciation was estimated by dividing initial cost adjusted for salvage value, by the years of useful life.
***Interest costs were estimated by multiplying the initial value of land, building, equipment and machinery by the interest rate. 15% per annum.

TABLE 4.--Variable Costs (Dollars) for an Eight Acre* (Growing Space) Container Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1982.

Item	Description	Unit	Cost per Unit	Quantity	Total Variable Cost
Materials					
Container	#2, 8 1/2" x 8" copolymer propylene	each	0.29	100,620.00	29,180
Soil mixture	Pine bark, sand, nutrients (Taxus & Rhododendron)	cu yd	33.00	279.20	9,214
	Hardwood bark, sand, nutrients (Juniperus, Cotoneaster & Virburnum)	cu yd	31.00	526.08	16,308
Liners	2-year 6-7" liner (Juniperus)	each	.95	26,885.00	25,541
	2-year 6-7" liner (Cotoneaster)	each	.85	21,820.00	18,547
	3-year 6-7" liner (Taxus)	each	1.25	21,140.00	26,425
	2-year 6-7" liner (Virburnum)	each	1.00	17,040.00	17,040
	2-year 6-7" liner (Rhododendron)	each	1.25	13,735.00	17,169
Polyethylene film	4 mil white, 32' x 225'	each	107.00	51.00	5,457
Thermal blanket	4 - 1/4" 80" x 225' per house (Cotoneaster & Rhododendron)	each	775.00	1/3(20.40)	5,270
Strip tags	5/8" x 7" plastic strip tag	each	.02	95,650.00	1,913
Chemicals	Oxadiazon 4G (Ronstar) (herbicide)	pound	.90	1,460.00	1,314
	Benomyl 50 WP (Benlate) (fungicide)	pound	10.00	30.00	300
	Demetron 6 (Meta-Systox-M) (insecticide)	ounces	.71	260.00	185
	Cyhexatin 50WP (Kelthane) (miticide)	pound	22.25	7.50	167
	Chlorothalonil 10M cu ft (Termil) (fungicide)	canister	1.90	301.00	572
	Lesco 3-4 mo (20-6-12) + Fe (Taxus & Rhododendron)	pound	0.80	10,019.42	8,016
	Osmocote 8-9 mo (18-6-12) (Juniperus, Cotoneaster & Viburnum)	pound	.86	9,731.60	8,369
	Urea 45-0-0 (fertilizer)	pound	.13	13,142.00	1,708
	Glyphosate (Roundup) (herbicide)	quart	16.60	14.00	232
Subtotal					192,927
Machinery and Equipment					
	Tractor, 60 HP	hour	15.85	133.00	2,108
	Tractor, 28 HP	hour	4.92	517.00	2,544
	Manure spreader, 130 bu	hour	1.58	43.00	68
	Wagon, 4-wheel	hour	0.53	778.00	412
	Irrigation/well, pump 75 HP	hour	6.65	735.00	4,888
	Inground irrigation system	hour	1.54	735.00	1,132
	Above ground irrigation system	hour	3.09	735.00	2,271
	Fertilizer injector	hour	4.33	120.00	520
	Airblast sprayer	hour	23.98	16.00	384
	Forklift	hour	6.59	130.00	857
	1/2 ton pick-up truck	hour	8.51	375.00	3,191
Subtotal					18,375

Table 4 Cont.

Item	Description	Unit	Cost per Unit	Quantity	Total Variable Cost
Labor					
	Labor hours	hour	5.15**	7,863.00	40,494
	Related labor hours	hour	5.15	1,573.40	8,103
Subtotal					48,597
Interest Charge on Operating Capital	Computed at 15% on an annual basis for 6 months	percent	7.5 (0.075)	259,899.00	19,492
Total Variable Costs					279,391

*Total Nursery - 17.04 acres, 340,000 sq ft of growing space, 204,000 sq ft of polyhouse space.
**Average basic wage before withholding taxes and fringes $4.30, taxes and fringes add 19.84% or $0.85 for a total of $5.15.

TABLE 5.--Summary of Fixed, Variable and Total Costs (Dollars) of Operating an Eight Acre* (Growing Space) Container Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1982.

Item	Group I (Juniperus)	Group II (Contoneaster)	Group III (Taxus)	Group IV (Viburnum)	Group V (Rhododendron)	Total
Fixed Cost						
Land and improvements	8,616	8,616	8,616	8,616	8,616	43,080
Buildings	10,190	10,190	10,190	10,190	10,190	50,950
Machinery and equipment	9,129	9,129	9,129	9,129	9,129	45,645
General overhead	19,005	19,005	19,005	19,005	19,005	95,025
Interest on general overhead, insurance, and taxes	1,577	1,577	1,577	1,577	1,577	7,885
Subtotal	48,517	48,517	48,517	48,517	48,517	242,585
Variable Costs						
Materials	45,631	38,268	45,095	30,818	33,113	192,925
Machinery and equipment	3,675	3,675	3,675	3,675	3,675	18,375
Labor	12,633	10,024	10,341	8,333	7,266	48,597
Interest on operating capital	4,645	3,898	4,433	3,212	3,304	19,492
Subtotal	66,584	55,865	63,544	46,038	47,358	279,389
TOTAL	115,101	104,382	112,061	94,555	95,875	521,974
Salable Plants per Year	25,600	20,730	20,085	16,185	13,050	95,650
~~Annual~~ Cost per Salable Plant	4.50	5.04	5.58	5.84	7.35	5.46

*17.04 Acres, 340,000 sq ft of growing space, 204,000 sq ft of polyhouse space

TABLE 6.--Summary of Fixed, Variable, and Total Costs (Dollars) per Salable Plant of Operating an Eight Acre* (Growing Space) Container Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1982.

Item	Group I (Juniperus)		Group II (Cotoneaster)		Group III (Taxus)		Group IV (Viburnum)		Group V (Rhododendron)		Average	
	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost
Fixed Cost Items												
Land and Improvements	.34	(8)	.41	(8)	.43	(8)	.53	(9)	.66	(9)	.45	(8)
Buildings	.40	(9)	.49	(10)	.51	(9)	.63	(11)	.78	(11)	.53	(10)
Machinery and Equipment	.36	(8)	.44	(8)	.45	(8)	.56	(9)	.70	(9)	.48	(9)
General Overhead	.74	(16)	.92	(18)	.95	(17)	1.18	(20)	1.46	(20)	.99	(18)
Interest on General Overhead, Insurance, and Taxes	.06	(1)	.08	(2)	.08	(1)	.10	(2)	.12	(2)	.08	(1)
Subtotal	1.90	(42)	2.34	(46)	2.42	(43)	3.00	(51)	3.72	(51)	2.53	(46)
Variable Cost Items												
Materials	1.78	(40)	1.85	(37)	2.24	(40)	1.90	(33)	2.54	(35)	2.02	(37)
Machinery and Equipment	.15	(3)	.18	(4)	.18	(3)	.23	(4)	.28	(4)	.19	(4)
Labor	.49	(11)	.48	(9)	.52	(10)	.51	(9)	.56	(7)	.51	(9)
Interest on Operating Capital	.18	(4)	.19	(4)	.22	(4)	.20	(3)	.25	(3)	.21	(4)
Subtotal	2.60	(58)	2.70	(54)	3.16	(57)	2.84	(49)	3.63	(49)	2.93	(54)
Total Cost per Salable Plant	4.50	(100)	5.04	(100)	5.58	(100)	5.84	(100)	7.35	(100)	5.46	(100)

*17.04 acres, 340,000 sq ft of growing space , 204,000 sq ft of polyhouse space