Table 6. Internal rate of return for a floricultural operation.

Period	After-tax profit less principal payment	After-tax cash flow
Initial investment	-$101,925	-$101,925
1	16,230	40,349
2	16,682	26,140
3	17,125	26,152
4	17,555	26,582
5	17,970	26,998
6	18,368	18,368
7	13,433	13,433
Internal rate of return (%)	3.69	19.40

of the planning horizon (7-years). The market value at the end of the seventh year was estimated to total $39,478 (4% annual real estate appreciation). After-tax, the value amounts to $35,530, less the remaining loan balance of $43,840 (includes all capital improvements). Obviously, since the value of the ornamental site after taxes on the capital gains is less than the remaining loan balance, some of the after-tax profit will be needed to pay off the remaining loan balance. Should the planning period be longer or the capital investments be smaller, then less after-tax profit would be needed to repay the remaining loan balance.

The distinguishing factor between the internal rates of return for the after-tax profit less principal payment and after-tax cash flow is the tax benefits. The tax benefits were included in the after-tax cash flow internal rate of return estimate. The evaluation assumes the individual can use these benefits in the proposed ornamental investment project or from outside income. The after-tax profit less principal payment was used to provide the investor with an internal rate of return estimate for the investment, ignoring tax benefits. In other words, this estimate is the internal rate of return on the investment in the event that the tax benefits could not be utilized.

Results and Discussion

The decision to implement an ornamental production program should be based on whether the investment meets the investor's profit objectives. The evaluation of the ornamental project presented in this analysis uses the internal rate of return as a financial measurement that allows individuals to determine whether an investment meets the desired level of return and to compare this investment with other investment opportunities, as shown in Table 6.

For instance, the internal rates of return generated in the example in this paper were 3.69% and 19.40% for after-tax profit less principal payment and after-tax cash flow, respectively. These internal rates of return may be used to compare with annual percentage rate (APR) earned on certificates of deposits (savings certificates) and other investment alternatives provided they account for tax considerations and length of time. Given the example situation and assuming the investor could use the tax benefits, he would choose an investment that would meet or exceed the after-tax cash flow internal rate of return of 19.40% on the ornamental project. If the investor could not use the tax benefits, then this individual would choose and investment that would meet or exceed the after-tax profit less principal payment of 3.69% on the ornamental project. In this situation, the comparison of the after-tax profit less principal payment internal rate of return of 3.69% with a certificate of deposit that could earn an after-tax profit internal rate of return of greater than 3.69% (>4.92% APR at 25% tax rate) would result in the ornamental investment project being rejected.

Interested growers and investors using an ornamental investment analysis procedure before committing capital will likely be more aware of how certain production factors affect profitability and make more informed decisions. The time spent in prior planning and investment analyses costs much less than discovering a certain project will not work after capital is committed.

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ELECTRONIC SPREADSHEET FOR WOODY ORNAMENTAL NURSERY BUDGETING

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Abstract. **A flexible budget procedure was developed using an electronic spreadsheet template to allow nursery managers to calculate per unit costs of production. The method permits the user to compensate for losses and idle nursery space as well as variable lengths of time in production. The budget provides management data for decision-making such as which nursery species or container size to produce and guidelines for cost-based pricing. An example, using 1984 Nursery Business Analysis data, was developed.**

Essential formulae for the spreadsheets are presented using VisiCalc, which is "upwardly transportable" or adapted for other types of spreadsheets.

Budgeting is a business planning tool for making both long range and short term management and financial decisions. Microcomputers and electronic spreadsheet software provide a means of reducing the tedium and drudgery of budgeting. Templates take advantage of spreadsheets' characteristics of flexibility, adaptability, and relative ease of use. Recalculation capability of spreadsheets makes them the most widely used type of microcomputer software. Farm computer users report that 87% use electronic spreadsheets, approximately half (48%) of those in use are versions of VisiCalc (1).

Materials and Methods

Nursery costs. Row crop farmers use enterprise budgets to compare the potential profitability of alternative crops, putting costs and returns on the comparable basis of dollars per acre annually. Nursery production, with no single container size, no common plant density, and no uniform production time period, requires an artificial unit on which to make cost and return comparisons analogous to the corn producer's annual acre. A convenient indexing factor or common denominator is the occupancy by a nursery crop of multiples of the square-foot month in production (2, 3, 4).

Two separate and distinct classifications of costs are involved. Direct costs are those which may be assigned specifically to the plant which is being produced. Direct costs include the costs of containers, certain labor operations, media, fertilizer, and liners. These costs are easily accountable; they are visible and obvious; they change depending on the type and size of plant produced. Indirect costs are those costs which are not readily charged to any particular plant species or container size. They represent general nursery expenses, which must be allocated to the plants produced on a pro-rata basis. Depreciation and interest on invested capital, together with overhead and general administration costs of electricity, travel, insurance, advertising, etc., are combined for a total indirect cost. This cost is then assigned to plants proportionately based on their occupation of bed space in the nursery. In this format, indirect costs are allocated on a square foot per month basis. Plants are charged a "rent" for using two of the most valuable factors the nursery controls: time and space (2).

Analysis. Average values from 25 respondents of the 1984 Nursery Business Analyses for container nurseries are used to typify a nursery (5). The example nursery has 330,238 square feet of actual production space. Costs for cash and noncash items are entered on lines 2-22 as user input in the spreadsheet format as shown in Table 1. The user specifies the percent of any cost category to allocate to indirect costs. For example, it is assumed that 85% of the owner-operator's salary is attributed as an indirect cost; 85% of his time is in supervision, management, and control and, thus, is an overhead expense to the nursery as a whole. Fifteen % of his time is production related and directly accountable as a crop-specific activity. On the other hand, 30% of hired labor is allocated to indirect costs, and the remainder is directly assignable to crop production. All liner, media, container, fertilizer, and pesticide costs are entered as zero percent indirect costs. All costs in these categories can be directly assigned to one or another specific production enterprise.

Table 1. Electronic spreadsheet for budgeting container nursery costs and developing an asking price.

ROW				
	Enter Expenditures from Records in Lines 2-22			
1				
2				
3	1. Total Square feet of Production Space			330238
4		1984	%	
5	Cash Costs	Ave.	Indir	Total
6	2. Operator's Salary	34341	85	29190
7	3. Other Wages & Salaries	103016	30	30905
8	4. Plants & Seed to Grow	30990	0	0
9	5. Containers & Pots	19350	0	0
10	6. Peat, Soil, Media	14292	0	0
11	7. Fertilizer & Lime	7469	0	0
12	8. Pesticides & Chemicals	5910	0	0
13	9. Other Prodt'n Supplies	10883	75	8162
14	10. Repairs & Maintenance	10684	100	10684
15	11. Equip. Operating Cost	13495	100	13495
16	12. Travel & Entertainment	3186	100	3186
17	13. Insurance	5616	100	5616
18	14. Telephone	2337	100	2337
19	15. Electricity	3386	100	3386
20	16. Taxes, Licenses, Bonds	2575	100	2575
21	17. Advertising	2999	100	2999
22	18. Rent—Land or Building	7099	100	7099
23	19. Other Cash Expenses	14629	100	14629
24	Total Cash Costs	292257		134263
25	Non-Cash Costs			
26	20. Depreciation: machinery	8993	100	8993
27	21. Depreciation: buildings	9948	100	9948
28	22. Interest at 12% on capital	5964	100	5964
29	Total and Indirect Costs	317162		159168
30				
31	Indirect Cost/Square Foot/Month		(cents)	4.02
32				
	Enter Data on Specific Enterprise in Lines 23-30			
33	23. Crop, variety, species or type			JUNIPER
34	24. Pot or container size			1 gal
35	25. Bed or bench space/pot	(square feet)		1
36	26. Total months in production			12
37	27. Loss rate		(%)	10
38	28. Turn-around time		(months)	2
39	29. Direct cost/pot			
40	a. container or pot		$	0.18
41	b. media		$	0.12
42	c. fertilizer		$	0.02
43	d. liner		$	0.18
44	e. other supplies		$	0.03
45	f. labor			
46	i. minutes → 4			
47	ii. wage/hour → 4.50		$	0.30
48	g. other		$	
49	30. Anticipated sales price/pot		$	1.75
50				
51	TIME-SPACE Requirment		$	15.33
52	Total direct cost/pot		$	0.83
53	Adjusted direct cost/pot		$	0.92
54	Indirect cost/pot		$	0.62
55	Total cost/pot (Breakeven price/pot		$	1.54
56	Net Return/pot or container		$	0.21
57	Net Return/Square Foot/Month		(cents)	1.38
58	Net Return/Square Foot/Year		(cents)	16.58
59				
60	Alternative Option: Developing an Asking Price			
61	31. Minimum acceptable annual "profit"		($)	45000
62	Asking price/pot needed for desired profit		($)	1.71
63				

The resulting value in spreadsheet coordinate G31 (the value at the intersection of column G and row 31) is the indirect cost per square-foot month. It represents the rate at which each plant or container will be accessed according to its occupancy of time and space in production.

Beginning with line 23, information including indirect costs is entered on a per container basis. Alternatively, an entire bed or multiples of containers may be entered as bulk or aggregated values and a single unit cost is derived. In this example, a 1 gal juniper is spaced out such that each container is taking up 1 ft^2 of space for 12 months. In addition, it is assumed that bed space will be vacant for 2 months following sale of this crop before new stock takes its place, the turn-around time. It is assumed that 10% of stock will be unsalable, and thus lost. Per unit costs of containers, media, liners, pesticides, fertilizer, and labor over the 12 months are entered in lines 29 a-g corresponding to coordinates G40-G47. The example nurseryman expects to sell containers for an average price of $1.75.

The critical calculation of this procedure is the TIME-SPACE requirement in coordinate G51. This is a factor based on months in production, loss rate, and turn-around time. Each container is allocated indirect costs on the basis of the TIME-SPACE factor. Total costs per container equals direct cost ($0.83) + [indirect cost/square foot/month ($0.0402) x TIME-SPACE requirement (15.33)], or $1.54. This represents a breakeven market price to cover all specified costs. Sellings all containers at an average $1.75 gives a net return per container of $0.21 but a net return per square foot per year of $0.165.

If the nursery has a "profit objective" of some minimum acceptable annual amount, as entered in line 31, the format prorates the amount, again using the TIME-SPACE requirement as the basis for allocation.

Results and Discussion

Once costs are entered from tax data Nursery Business Analysis information or other nursery accounts, an indirect cost per square foot per month is derived. The repetitive calculations for analyzing a large number of nursery enterprises may be done quickly and conveniently using the recalculation features characteristic of all spreadsheets. This template may be entered, with slight or no modification by typing words (labels) as they appear in the Table 1. Numbered lines (or rows) require user input. Unnumbered rows are calculated by the formulae built into the template. A listing of essential formulae (or values) which perform the calculation that appear in Table 1 are presented in Table 2. Formula coordinates correspond to the columns and rows indicated in Table 1. For example, the entry for the TIME-SPACE requirement column G, row 51 is represented as G51:/F$+G35+G38*G36/(1-(G37/100)). As with any computer software, the user should refer to the user's manual for unique features of his spreadsheet before adapting this format.

User entries in column G may be changed repeatedly to test production strategies. "What if" conditions, such as changing data entries to reflect physical production input-output relationships, provide useful management scenarios for the nurseryman. For example, junipers spaced at 3/4 square feet each and grown for 9 months would require a breakeven price of $1.30 per container. What if a different regime of fungicide application and additional fertilizer could reduce losses from 10% to 5%, at a cost of $0.035 of additional direct costs per container? The reduction in losses would lower the breakeven cost from $1.54 to $1.50 per container, raise profitability per square foot per month to $0.0172. If implemented over the entire nursery, this could represent an additional $13,500 in net revenue or before tax profit.

Table 2. Formulae calculating nursery costs using the electronic spreadsheet.

```
/GC9
/GRA
/GOC or /GOR
>G7:/FI+E7*(F7/100)
        Replicate over ranges    G7...G23RR and G26...G28RR
>E24:@SUM(E6...E23)
>G24:/FI@SUM(G6...G23)
>E29:@SUM(E26...E28)+E24
>G29:/FI@SUM(G26...G28)+G24
>G31:/F$(G29/G3)/12*100
>G47:/F$+D47*D46/60)
>G51:/F$1G35*G36/(1-(G37/100))+G38
>G52:/F$@SUM(G40...G48)
>G53:/F$+G52/(1-(G37/100)
>G54:/F$+G51*(G31/100)
>G55:/F$+G53+G54
>G56:/F$+G49-G55
>G57:/F$+G56/G51*100
>G58:/F$+G57*12
>G62:/F$+G61/12/G3*G51+G55
```

The remainder of spreadsheet entries are labels or user data. These formulae correspond to row and column coordinates in Table 1. Template was developed on TRSDOS 1.3 VisiCalc.

The format presented here is simple. Essential to any accurate budgeting attempt in analyzing nursery production is the establishment of a single index or measure, such as the cost and return based on a container's occupancy of nursery space over time. Net returns per month is a convenient unit of measure for dissimilar crop enterprises.

Nursery managers with access to spreadsheet software and a microcomputer have a powerful business planning tool at their disposal. Analyses such as the one presented here, provide the manager with critical decision-making data. This template is suggestive of the many uses to which electronic spreadsheets may be applied to the management and decision-making within the nursery.

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